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**POLYCHÆTA FROM THE COASTAL SLOPE OF JAPAN AND FROM KAMCHATKA
AND BERING SEA.**

BY J. PERCY MOORE.

Hitherto our knowledge of Japanese Polychæta has been limited to collections made in the littoral zone at several points along the south-eastern coast between Yokohama and Nagasaki and ably described in three papers by v. Marenzeller, a few species from the Japan Sea described by Grube and McIntosh, and to the results of about half a dozen dredge and trawl hauls made by the "Challenger" at points off Japan, which have been recorded by McIntosh.

At the close of an extended cruise in the South Pacific Ocean, the United States Fish Commission steamer "Albatross" spent the month of May and part of June, 1900, in dredging and trawling along the continental slope of Japan. During this cruise the vessel was in command of Captain J. F. Moser, U. S. N., with Dr. H. F. Moore as naturalist, to whom, and to Dr. H. M. Smith, of the Fish Commission, I owe the pleasure of studying the rich and interesting collection of Polychæta taken.¹

During May a line of about seventy dredging stations was run along the coast of Nippon or Hanshu from Yokohama westward about 200 miles, through Sagami and Suruga Bays and the Totomi Sea. These stations were mostly along the steep slope on the inner border of the Black Current, and about or within the 100-fathom line, though the trawl was sometimes sent down to much greater depths. In early June, ten additional stations were established along the coast of northern Nippon, beginning at the lower end of Sendai Bay and extending for about 120 miles northward, entirely within the 100-fathom line. Later in June several dredgings were made in the shallow waters and muddy bottoms off Kamchatka, and others north of the Aleutian Islands in the southern portion of Bering Sea. The details of location, depth, character of bottom, etc., will be found in a list of dredging records of the "Albatross" compiled by Mr. C. H. Townsend, and published in the *Report of the U. S. Fish Commission* for 1900. In this paper it has been thought necessary to give only the depth and

¹ Acknowledgment is due to Hon. George M. Bowers, Commissioner of Fisheries, for permission to publish the results in this form.

general locality, together with a list of the station numbers at which each species was taken.

All of the species contained in the collection have been determined and, with the exception of the families *Sabellidæ* and *Serpulidæ* and several species of other families which have been reserved for further study and comparison with material not now available, are recorded in the following list. A large number of species, either new or hitherto unreported from that region, are added to the Japanese fauna. One of the surprises of this study has been the very small number of Marenzeller's species which were taken by the "Albatross." Of the species previously known most of them belong to the circumboreal fauna, several were dredged by the "Challenger" at points off Japan, and the others have been recorded from various more or less distant parts of the world. As Marenzeller has in preparation an account of the geographical relations of the Japanese Polychæta, nothing more need be said on this subject. The general results remind one of those attained by Verrill along the Gulf Stream slope of North America.

POLYNOIDÆ.

Harmothoe imbricata (Linn.) Mgrn.

The setæ of the two small specimens taken are colorless and the neuropodials slender.

Totomi Sea, 3,715, 65 fms.; Totomi Sea, 3,725, 12-13 fms.

Lænilla subfumida (Grube).

This is one of the very few Philippine species which have been found on the coast of Japan, from which it has not been hitherto recorded.

Sagami Bay, 3,702, 31-41 fms.

Polynoa semierma sp. nov. (Pl. XXIII, figs. 2, 3.)

Form long and slender, composed of 64 somites and measuring 42 mm. in length and 3 mm. in breadth, exclusive of parapodia.

Unfortunately the prostomium is in a very bad state of preservation and much altered, with all of the appendages, excepting one palpus, lost and only their position indicated by scars. The general shape of the prostomium is much as in *Harmothoe*, the anterior peaks being well-marked, pointed and widely separated. The left palpus has a length of four times the width of the prostomium and is slender and regularly tapering. Two pairs of black, very small, circular eyes can be distinguished, one lateral, about the middle, the other dorsal, near the posterior margin of the head. The protruded proboscis bears the usual jaws, but the papillæ have been destroyed. It has a length of 3.5 mm.

The parapodia are long and slender and especially so toward the caudal extremity. Neuropodium conical, divided terminally into pre- and post-setal lobes, both prolonged dorsally, and the former the larger; ventral surface studded with large spherical papillæ on short stalks. Notopodium a small, slender, freely projecting process supported by a distinct aciculum. Dorsal cirri with small ceratophores, and long, slender, regularly tapered styles which reach considerably beyond the setæ tips anteriorly, but posteriorly, owing to shortening of the cirri and lengthening of the feet, fall short of the setæ tips. Ventral cirri short, less than $\frac{1}{2}$ dorsal, thick basally and slender terminally; posteriorly they undergo the same relative change of position as the dorsal, and for the same reason.

Only about $\frac{1}{4}$ of the total number of elytra are *in situ* and are very easily detached, but the elytraphores indicate 25 pairs placed on the following somites: II, IV, V, then on alternate somites to XXIII, then on XXVI, XXIX, XXXII and XXXIV, and after that on every third somite to LXI. They are small, leaving a large portion of the back exposed, delicate and usually much distorted, nearly circular, with central attachment and quite without papillæ or hairs of any kind; the medial half is reddish-brown, the lateral unpigmented.

Notopodial setæ are totally wanting, but there is a relatively stout tapering aciculum. The neuropodial setæ are disposed in about 9 close rows; all are nearly colorless and rather slender. Those of the dorsalmost row or two form a distinct group which project beyond the others, and probably serve somewhat the purpose of the notopodial setæ of other species; their shafts are scarcely more than $\frac{1}{2}$ the diameter of the other neuropodials and the ends are much prolonged and provided with close transverse rows of fine hairs quite to the simple tips. The others have the usual form, the more dorsal ones with simple tips and as many as 14 transverse combs, the middle and ventral ones with a more or less prominent accessory tooth at the tip and shorter enlarged ends with as few as 8 combs on the most ventral setæ.

Sagami Bay, 3,698, 153 fms.

Scalesetosus formosus sp. nov. (Pl. XXIII, figs. 4, 5, 6.)

This species is referred to McIntosh's genus on account of the form of the head and neuropodial setæ, the latter being very characteristic; in many other respects it departs widely from the generic type. The single example on which the description is based is complete, but broken into three pieces, and with the scales detached. At the posterior end is a small regenerating piece, but the form of that region, and especially the structure of the parapodia, indicates that it is of prac-

tically the normal length. The form is slender and tapers very slightly to the caudal end. The total length is 24 mm., the maximum width of the body 2 mm., and between the tips of the parapodia 4.5 mm.

Prostomium about as broad (across the ocular lobes) as long, marked for its entire length by a median dorsal groove which widens anteriorly to a broad and deep cleft separating the rounded frontal lobes or peaks; the narrowest part of the prostomium is at the posterior border, anterior to which the lateral borders diverge, then swell out abruptly at about the middle as prominent rounded lobes which bear the anterior pair of eyes. Ceratophores of tentacles nearly spherical, possibly the result of contraction; the median crowded between the cephalic peaks into the frontal cleft; the lateral partly beneath the median and well below the peaks; style of median antenna lost; the lateral very short and thick, scarcely longer than its ceratophore, and its diameter equal to $\frac{1}{2}$ its length, ovate pyriform and little pointed. Palpi slender, tapered regularly to tip, about $2\frac{3}{4}$ times length of prostomium. Eyes 2 pairs, both very large, especially the anterior, but lightly pigmented, the anterior pair situated on the ocular lobes, the posterior slightly caudad and mesiad, and nearly or actually in contact with the anterior.

Tentacular cirri, or at least the ventral, which alone remain, about $\frac{1}{2}$ as long as palpi, to which they have a similar form, with the distal half more slender. There are 57 somites in addition to those in regeneration, and all but the peristomium and pygidium are setigerous. Ventral surface smooth, sole-like, with rounded margins separated from the bases of the parapodia by a groove on each side. No visible nephridiopores or papillæ. Elytrophores prominent, nearly cylindrical or slightly tapering; the median space of the back scarcely exceeding in width their diameter.

Parapodia large and prominent, similar throughout the series, except that the dorso-ventral diameter decreases toward the posterior end. Neuropodium much larger than notopodium, broad, flat, leaf-like, its lateral margin broadly rounded, the ventral convex, and dorsal concave, so that as a whole it appears to have a slight curvature dorsad; at the end it is split into two vertical plates, both, especially the posterior one, being very thin and embracing the bases of the setæ between them for a considerable distance. Notopodium a rounded lobe arising from the anterior side of the dorsum of the neuropodium about its middle. Like the elytrophores, the dorsal cirrophores are remarkably large; although arising much nearer the base of the parapodia they reach as far laterad as, and at the same time much dorsad to, the noto-

podia; styles formed like the palpi but more slender, reaching scarcely beyond the tip of the neuropodia. Ventral cirri with short globular cirrophores placed about opposite to the notopodia; styles thickened basally but with filiform distal halves, and their tips just reaching the ventralmost neuropodial setæ. First ventral cirrus closely approaching the tentacular cirri in length.

Elytra 29 pairs, on II, IV, V, then on alternating somites to XXI, then on XXII, XXIV, XXVII, XXX, XXXI and again on alternating somites to LVII; all are in symmetrical pairs, and are easily detached, which is the condition of most of them. The first is nearly circular, the last somewhat triangular, the others broadly ovate with a slight excentric postero-lateral attachment. They are thin, smooth, colorless and translucent; with a very distinct nerve ramifying from the rear of attachment in dendritic fashion throughout the scale; there are no cilia nor papillæ, but numerous pellucid dots are scattered over the surface, in the center of each of which a small sense-organ appears.

Notopodial setæ few and irregularly arranged; they are short, reaching only half-way from their points of origin to the end of the neuropodium, slender, rather strongly curved, pointed and with transverse rows of excessively fine teeth along the convex border and half way or more around the seta. Neuropodial setæ arranged in a single vertical series which spreads in a broad fan-shaped figure, slightly separated into dorsal and ventral halves, slender and very long, probably quite equalling the parapodium when fully protruded, somewhat enlarged and bent below the slender, tapering, very finely serrulate, slightly hooked and undivided end; at the region of the thickening is a half ring of long, fine, comb-like teeth supported on a slight shoulder, which is placed on the ventral side of the setæ in the dorsal half of the bundle and the dorsal side of those in the ventral half. The most ventral setæ have shorter, stouter and more strongly hooked tips. Both notopodial and neuropodial setæ are colorless and beautifully transparent. The setæ of the first setigerous foot differs in no appreciable respect from the others.

Only the type known from Sta. 3,703, Sagami Bay, 31 fms.

Lepidonotus chitoniformis sp. nov. (Pl. XXIII, figs. 10, 11.)

Form short and broad, with a regular elliptical outline, depressed; the greatest width, whether measured between the tips of the setæ or the margins of the body, at the middle. The type measures 37 mm. long, 16 mm. wide, and 6 mm. deep.

Prostomium roughly square, the anterior and lateral margins slightly convex, the posterior concave; a pair of prominent posterior lateral ocular lobes, and the production of the anterior face into the

lateral tentacular ceratophores modify this form. Eyes 2 pairs; the anterior large and partly on the base of the posterior lateral lobes, as a consequence of which they face both forward and outward; the posterior are about $\frac{1}{2}$ the diameter of the anterior and are situated nearly on the dorsal surface close to, but slightly mesiad and caudad of, the ocular lobes.

Ceratophore of median tentacle about $\frac{2}{3}$ as long as prostomium, stout and distally swollen; style 4 times length of prostomium, slender, slightly tapering, with an abrupt egg-shaped subterminal enlargement having the large end distad, and followed by a terminal filament of equal or slightly greater length. Lateral tentacles similar in form to the median but only about $\frac{2}{3}$ as long, and the ceratophore only $\frac{1}{2}$ as long as that of the former. The colors of the tentacles are well preserved and striking in their contrast with the colorless head; the ceratophores are ringed with yellowish-brown, the basal half of the style strongly tinged with brown, the proximal half of the subterminal enlargement deep brown, and the rest pure white. Palpi about equaling median tentacle, rather stout, but their bases not enlarged nor extending laterally beyond prostomium, gently tapering, abruptly sharp pointed, but without terminal filament, densely ciliated, basal half pale brown.

Peristomial parapodium long, slender, reaching to the level of the tip of the tentacular ceratophore. Tentacular cirri similar in form and color to the tentacles but with somewhat longer terminal filaments, the dorsal equalling the median tentacle, the ventral somewhat shorter.

There are 26 somites, of which 25 bear setæ and 12 elytra. The nephridial tubercles occupy the usual position and point strongly laterad and slightly ventrad and caudad; the last pair, on XXVI, are in contact mesially and all except the first, on VI, are prominent.

Prominent dorsal papillæ occur on all the somites from II to XX inclusive, being median on II and on XV to XX, and in double paramedian series on III to XIV inclusive. The first one is a low, flat, nearly quadrate nuchal tubercle which somewhat overlaps the prostomium from behind; from III to XIV each somite bears a larger anterior and a smaller posterior pair; on III those of each pair are close together and united by slight transverse ridges; the others are well separated, the median interspace increasing in width with the segments; somites XV to XIX have each a single larger anterior and a smaller posterior papilla, and XX the large one alone.

The elytophores are large and shaped like the body of an oyster or even more like the human external ear viewed from the cephalic side.

On the cirri-bearing somites are smaller, and structurally somewhat simpler, but essentially similar structures, through which transverse muscles pass into the parapodia and dorsal cirri. As will be indicated below, they bear branchial filaments similarly to the elytophores, with which they are obviously homologous.

Branchial filaments occur on every somite from III to XXIV inclusive, except XXIII, the last somite bearing elytra, and minute rudiments on the anterior side even of XXV and XXVI. They appear to be mere hollow integumental sacs generally of simple finger-like form. On elytra-bearing somites they are disposed as follows: One arises from the antero-external and one from the postero-external margin of the elytophore. The former is present on every elytophore except the first and last, is unbranched but bends sharply laterad at a right angle. The latter is longer, and on typical somites divides into a short medial and a long lateral branch diverging at right angles from the short stem; it is altogether absent on the first and the medial branch is wanting on the 11th and a few of the anterior elytophores. On the parapodium are 2 dorsal, 5 or 6 anterior and 4 or 5 posterior filaments (in addition to 1 or 2 rudimentary ones on the base of the elytophores), the most ectal one in each case being bifid. Anterior to the 5th and posterior to the 11th elytra-bearing somite this arrangement is simplified by reduction in the number of filaments. Essentially the same arrangement obtains on the cirri-bearing somites, but the filaments are more numerous, larger and sometimes even trifid. The elytophore filaments are represented anteriorly by 2 simple ones, and posteriorly by 3, of which the middle one is bifid. There are usually 5 dorsal parapodial filaments, of which one at the base of the cirrus, like the most external on the anterior and posterior faces of the parapodia, is usually trifid.

The parapodia are stout, with the neuropodium of a somewhat compressed, obliquely truncated conical form and the notopodium a rather prominent short tubercle on the anterior dorsal face near the base of the parapodium. The ventral surface of the parapodia, and indeed of the entire body, is covered with a close nap of short, fine processes. Ventral cirri with low tubercle-like ceratophores borne on the middle of the ventral neuropodial surface; their styles short, scarcely reaching half-way to the end of the foot, the basal half stout and swollen, the distal tapered to a sharp point, but with no proper filament. The dorsal cirri are quite long, their filamentous tips at least reaching quite beyond the setæ line; they have exactly the shape and color of the tentacular cirri, but on the base of each is a prominent bilobed glandu-

lar swelling; the last pair, instead of being longer, is shorter than the others; otherwise both ventral and dorsal cirri present the usual modifications toward the end of the body.

The very regular outline of the body, when seen from above, is due to the dense tufts of dorsal setæ which project beyond the margins of the scales and conceal all but the tips of the ventral setæ, and from below to the remarkably even arrangement of the neuropodia and the ventral setæ. The dorsal setæ are very numerous and spread chiefly in a horizontal plane, but in such a way as to overlap successively from behind forward. They are very delicate, capillary, tapering from base to tip and furnished with fine but distinct opposite or nearly opposite processes of a length 3 to 4 times the diameter of the stem. The ventral setæ are arranged in very regular horizontal rows, 7 or 8 of which are subacicular and 2 supraacicular; except the dorsalmost and ventralmost rows, which have fewer, each contains 4 setæ. They are of a beautiful pale amber color, and transparent, moderately stout, slightly curved and with the tip smooth and strongly hooked. As in *Euphione* they are densely bearded toward the end, about $\frac{1}{3}$ or $\frac{1}{4}$, according to the position of the seta, of the exposed part being provided with numerous rows of long fine hairs, the terminal ones of which curve backward and envelop the tips. On the first setigerous somite the ventral setæ are slender and tapering, with a close beard of fine hairs.

Twelve pairs of elytra are borne on somites II, IV, V, VII, IX, XI, XIII, XV, XVII, XIX, XXI, and XXIII. They are large, strongly imbricate and decussate, and so close-fitting that their boundaries can scarcely be distinguished except at the margins; the attachment to the elythrophones is unusually firm. The first is irregularly circular with a nearly central scar, the last roughly triangular, and the others more or less bean-shaped, the more anterior ones being deeply emarginated and asymmetrical. The 7th is the largest and the size falls off each way to the 1st and 11th, the 12th again becoming larger. Cilia form a strong marginal fringe around more than $\frac{3}{4}$ of the circumference of the scale, only the covered anterior portion being free; they are longest and coarsest on the lateral half of the anterior border, from which large papillæ are wanting, and where they are about equal to the longest papillæ present on the scale; a small group of rather large ones occurs also on the medial margin. Small cilia are scattered sparingly over the greater part of the exposed surface of the scales and are larger and more numerous on the area external to the scar ridge. The papillæ are remarkable for their size and form, and cover the entire upper surface. The anterior medial region and a narrow area along the ante-

rior lateral border bear only small, low, smooth papillæ; from these areas they gradually differentiate into several distinct forms. Lower flat papillæ with from 4 to 8 peripheral radiating spines occur chiefly on the postero-lateral half; a few especially large examples of this type which lie just behind the scar ridge may bear 1 or 2 apical spines in addition to the peripheral ones. Smooth globular papillæ without spines are occasionally found with the latter. Along the scar ridge are 1 to 3 (of which the mesial one is the largest and most characteristic) very large papillæ having the form of an irregular inverted cone, the enlarged end of which is thickly studded with rough processes. On the entire area between the lateral end of the scar ridge and the postero-lateral margin are numerous large, pale or colorless, erect, clavate papillæ with slender pedicels, and studded with peculiar rough scaly nubs. A single marginal rank of similar but larger, recumbent and usually brown papillæ extends around the entire postero-internal border. The papillæ vary much in color; those on the ridge are generally yellowish-brown, the others varying shades of yellowish-gray, gray with yellow spines, brown or nearly black. The darkest are usually found in a small group just mesiad of the scar ridge. The 1st scale bears a central group of the large rough papillæ and a complete marginal circle of clavate ones, beneath which is a circle of short cilia. The last has club-shaped papillæ on its lateral margin only, and nearly its internal half is free from cilia.

When the scales are in place the entire animal presents a striking superficial resemblance to a *Chiton*. The rough scale ridges converge in each pair to form a series of V's pointing forward.

Type, Sagami Bay, 3,700, 63 fms.; Totomi Sea, 3,733, 49 fms.; also one from an unknown station.

Lepidonotus branchiferus sp. nov. (Pl. XXIII, figs. 7, 8, 9.)

Outline short, broad, elliptical, very regular, somewhat depressed. Length 26.5 mm., width to tips of setæ 14 mm., to margins of scales 11 mm., depth 6 mm.

Prostomium decidedly wider than long, its lateral margins with prominent preocular protuberances, making this the broadest region; eyes two pairs, rounded, black, the anterior much the larger and more prominent, the posterior distant from them less than their own diameter mesiad and caudad. Median tentacle with stout cylindrical basal piece slightly shorter than prostomium; style about 4 times the length of prostomium, tapering to a slender region beyond which is a subterminal ball and a short terminal filament. Lateral tentacles with ceratophores less than $\frac{1}{2}$ that of median tentacle, and continuous with

frontal processes of head, which are slightly dorsad of the level of the median ceratophore; style similar in form to median but with a relatively longer terminal filament which reaches only to the median ball. Palpi with very broad, widely separated bases, fully half of which project beyond the sides of the head; otherwise they are similar in form to the palpi of *L. chitoniformis*; basal $\frac{2}{3}$ brown, the rest white.

Peristomial parapodia not quite reaching to tip of median tentacular ceratophore; the dorsal tentacular cirrus, which alone remains in the only specimen, similar in form to median tentacle, but with a longer filament, and the entire style slightly shorter. The protruded proboscis has a length of 6 mm. and a diameter of 3.7 mm. It bears four light brown fang-like jaws of the usual form, and thirteen papillæ above and thirteen below, all but the small lateral ones, which are simple, being strongly curved, compressed and bilobate. There is also a transversely elongated low subterminal ventral papillæ.

Total number of somites, including peristomium, 26; setigerous somites 25; elytra 12 pairs. Nephridial papillæ may be detected as far forward as IV, but the first 3 are very small, the others exactly as described for *chitoniformis*. Except that the difference in size between the anterior and posterior ones of the dorsal series is less evident, the dorsal tubercles are exactly as in *L. chitoniformis*. No important differences are to be noted in the form and structure of the elytrophores.

The branchiæ have the same arrangement as in *L. chitoniformis* and, although fewer and simpler, are larger and more conspicuous than in that species. All are rather long and slender and entirely unbranched, and are directed more or less laterad and dorsad. None occurs on the dorsum of the parapodium. On the elytra-bearing somites one arises from each the posterior and anterior border of the elytrophore, the former being somewhat the larger and more laterad. On the anterior face of the parapodium is a series of about 3, arranged along a line from the one mentioned above to the base of the ventral cirrus, to which, however, it does not reach; one or two smaller detached processes may lie ventrad of the middle of this series. On the posterior face usually 3 in a group are found below the outer end of the elytrophore, at a lower level than the anterior series. On the cirrhiphorous somites the arrangement differs slightly. A short anterior one arises from the border of the ridge passing to the cirrus; an oblique series of 4 occurs on the anterior face of the parapodium. Posteriorly there are two marginal, a cirral which arises from the base of the cirrus in actual contact with its posterior gland, and 2 or 3 others lower down on the posterior

face of the parapodium. Toward the ends of the body the number of branchial filaments diminishes.

The parapodial dorsal and ventral cirri are much the same as in *L. chitinoformis*, but the dorsal cirrus is somewhat shorter, just barely reaching the ventral setæ tips; its knob is generally more spherical, and its basal glands, while similarly arranged, much longer.

Both dorsal and ventral setæ are similar in their arrangement to those of *L. chitoniformis*. The former are shorter than in that species, leaving the entire bearded portion of the ventral setæ exposed from above, and are more slender, softer and more densely provided with longer lateral processes, which are arranged either in tufts or whorls, the exact arrangement being uncertain owing to the presence of an incrustation of foreign matter. The latter are somewhat stouter, with shaggier beards of fewer rows of hairs; one was found with a terminal sheath still partly in place.

In number, arrangement, form, and even in the character of their papillæ and cilia, the elytra of this species approximate those of *L. chitoniformis*. The chief difference lies in the larger size of the granules and the strong tendency of the papillæ to become spinous. The papillæ immediately surrounding the low scar ridge are of a stellate form with long, sharp-pointed rays bearing one or more conical spinous on the upper side. The largest of this type are posterior to the ridge, where occur also a few nearly globular papillæ bearing a single long conical spine. On the medial side of the scar ridge these papillæ become gradually more irregular and oblique, finally passing into the smaller papillæ whose pointed summits are directed toward the posterior margin of the scales. Toward the covered area of the scale all papillæ become smaller and smoother, and soon low, rounded and colorless. Clavate papillæ occur in the lateral area, and in a postero-lateral marginal row; they are relatively smaller and much more slender than in *L. chitoniformis* and bear numerous prominent conical points instead of rough nubs. The erect ones of the lateral area bear a number of spines, varying with the size of the papilla, along all parts of their sides and summits, whereas the reclining ones of the marginal row have spines on the upper or exposed surface only. Over the region of the scar, in addition to the stellate papillæ, which there attain their maximum size, are from 4 to 6 particularly prominent papillæ crowned with numerous short spines arranged in a tuft. In spite of their roughness all of the papillæ, even the largest, are soft. The covered portions of the scales and the lateral zone are colorless, the middle and posterior parts yellowish-brown, against which the various colored papillæ

stand out clearly. The larger papillæ are chocolate-brown, reddish-brown, yellowish-brown, partly brown and partly yellow, or, in striking contrast, white, and it is very seldom that two adjacent ones are of the same color.

One specimen, type, Sta. 3,702, Sagami Bay, 31-43 fms.

L. branchiferus and *L. chitoniformis* are evidently closely related to *L. giganteus* Kirk from New Zealand which, according to Thomson, possesses essentially similar branchiæ and dorsal tubercles, and exhibits additional features of resemblance in the elytra and setæ. In a number of respects all three depart from the typical species of *Lepidonotus* and might very properly be segregated as a distinct generic group. *Lepidonotus branchiata* (Treadwell) from Porto Rico possesses similar branchiæ, but the setæ and elytra are quite different and no reference is made in the description to dorsal tubercles.

Lepidonotus cælurus sp. nov. (Pl. XXIII, fig. 12.)

The form is, as usual in the genus, short and compact, but much more slender than the 2 species just described; the largest specimen measures 25 mm. long, exclusive of the tentacles and anal cirri, and 8 mm. wide to the tips of the setæ. Number of somites 26, 25 bearing setigerous parapodia, and 12 elytra. Ventral surface smooth, with nephridial papillæ from VIII to XXV inclusive; all but the first are prominent and tubular and project freely caudo-laterad.

Prostomium slightly wider than long, though the continuation of the peaks into the bases of the lateral tentacles gives it a somewhat elongated aspect. Eyes normally 2 pairs, which have coalesced in the type; the posterior near the caudal end of the lateral surface, but not concealed by the nuchal fold, looking latero-dorso-caudad, heavy black, circular; the anterior lateral, at the point of greatest width, looking latero-dorsad, larger than the posterior and elliptical or crescentic, black.

Except the palpi the cephalic appendages are very easily displaced, and the median tentacle is present in the type alone. Its total length is about 5 times the head, of which $\frac{1}{4}$ is made up of the basal piece and $\frac{5}{12}$ of the filamentous tip; basal piece constricted at the middle, the proximal portion more opaque and smoother; style slender throughout and tapering to a slightly subterminal enlargement, beyond which it diminishes suddenly to the filiform tip. The lateral tentacles are more often preserved and vary considerably in length. They have the same general form as the median tentacle, but are longer and decidedly more slender, with the subterminal enlargement scarcely evident, and the filiform tip longer (up to $\frac{1}{2}$ of the entire length); the basal

piece, which is continuous with the prostomial lobes, is slightly shorter, and arises at a slightly more ventral level. Palpi about 3 times length of prostomium, thickened basally, tapered to end, which bears a very short terminal filament.

The peristomium presents no noteworthy features. Tentacular cirri similar to lateral tentacles, the dorsal somewhat exceeding median tentacle, the ventral slightly shorter; the slender parapodium, which supports them, reaching beyond the tentacular basal pieces.

The typical parapodium (X) presents the following features: neuropodium large, nearly truncate or slightly angulated at the point from which the deep brown aciculum protrudes, ventral margin horizontal, dorsal sloping with a slight curve to the elyrophore; notopodium a mere lobe on antero-dorsal face of neuropodium, supported by a slender aciculum. Ventral cirri with a short filiform appendage, the tip of which falls short of the bases of the neuropodial setæ; dorsal cirri borne on prominent ceratophores which have a dorso-caudad position with relation to the foot, similar in form to the tentacular cirri, about $2\frac{1}{2}$ times as long as the ventral cirri, of which length the ceratophore constitutes $\frac{1}{3}$.

The ventral cirrus of the 1st foot is, as usual, longer; on the last two the dorsal ceratophores become posterior; the last foot lacks the notopodium, or at least the notopodial setæ. The anal cirri are the longest appendages of the body, fully twice the dorsal cirri, and bear very long filiform tips.

Twelve pairs of elytra are borne on somites II, III, IV, VI, VIII, X, XII, XIV, XVI, XVIII, XXI and XXIV. They are strongly imbricated and tough, membranous and firmly attached. With the exception of the first and last they are elongate-pyriform, or more ovate posteriorly, attached posterior to the middle, and with the slender pre-peduncular portion covered by the preceding scale; the first is broadly ellipsoidal, the last roughly triangular with the longest side mediad and the angles rounded. With the exception of a narrow smooth area at the anterior end, the entire dorsal surface of the scale is thickly clothed with papillæ of various kinds. Anteriorly are a few small conical spines with apices directed obliquely toward the posterior margin of the scale. Farther back they become larger and more numerous and distinctly differentiated into two forms distributed to the internal and external halves of the scale. On the external area they remain smaller and depart less from the simple conical form, but most of them develop a few jagged points at the apex and become more elevated, especially those of a marginal series, which are larger and somewhat club-shaped. On

the internal area a gradual transition into larger, rounded, rough papillæ takes place, especially over the area of attachment where this kind occurs nearly exclusively; but elsewhere they are interspersed with papillæ of the same type as, but larger than, those of the external area. The large papillæ are of a globular or haycock form and reach a diameter of 10 or even 20 times that of the spines. Their surface markings are very peculiar and characteristic, somewhat resembling the chasing of a cane or umbrella head, but rougher than such work is customarily. Sometimes the markings are very regularly arranged in rows converging to the apex, and may then be simply roughened ridges and grooves, or rows of overlapping scales or even spines. The first and last elytra are the roughest of all and have the largest papillæ. A strong fringe of long cilia marks the posterior external margin of typical scales and nearly encircles (except for a small part of the internal margin) the first. The longest have a length of about $\frac{1}{8}$ or $\frac{1}{7}$ of the greatest transverse diameter of the scales, but become much shorter on approaching the mesial side, along the whole exposed portion of which they are continued as integumental sense-organs of gradually diminishing length.

The notopodial setæ form a large spreading tuft, but their tips scarcely reach beyond the end of the neuropodium; they are pale hay color, capillary, bipinnate, with the lateral processes alternating. Owing to a constant coating of foreign substances few details can be made out. Neuropodial setæ arranged in 3 supraacicular and 5 subacicular horizontal rows, amber-colored, relatively slender, with the smooth tips unusually long, and except on the most dorsal, exceeding the spinous portion in length; 4 transverse rows of spines on the ventralmost setæ, 9 on the dorsalmost.

Some color is retained in the elytra, which are yellow or brown, sometimes with an irregular greenish blotch surrounding a pale area opposite the point of attachment, the larger papillæ usually dark brown. The dorsal cirri and all cephalic appendages, with the exception of the palpi, have a broad zone of dark green pigment above the base, and a deeper but narrower one just proximad of the subterminal enlargement.

Lepidonotus calorus somewhat resembles *L. pleiolepis* von Marenzeller, but differs especially in the numerous spheroidal papillæ on the elytra and the more slender form and longer smooth tips of the neuropodial setæ.

Sagami Bay, 3,698, 153 fms., type and 8 other specimens; Suruga Bay, 3,707, 63-75 fms.

Lepidonotus (Hylosynda) vexillarius sp. nov. (Pl. XXIII, figs. 13, 14, 15.)

A rather slender species, measuring 23.5 mm. in length, 2.5 mm. in maximum breadth of body on the ventral surface of X, 4 mm. to ends of parapodia, and 5.5 to tips of setæ.

Prostomium slightly wider than long, sides smoothly convex without any prominent lateral lobes, posterior margin for its middle half continuous with peristomium, frontal sinus very shallow. Eyes 2 pairs, black, circular; the anterior larger and situated close to lateral margins at widest part of head; posterior on postero-lateral curvature, looking caudad, dorsad and laterad. Median tentacle arises from dorsal sinus nearly on the level of the dorsal surface of the prostomium; its ceratophore about $\frac{2}{3}$ as long as prostomium, white with a very conspicuous circular light brown spot covering most of the dorsum of the basal half; style scarcely three times as long as prostomium, of graceful form, tapering very gradually for the first $\frac{2}{5}$, then increasing even more gradually to near the end of the next $\frac{2}{5}$, then suddenly rounding off and bearing a delicate terminal filament, which makes up the final $\frac{1}{5}$; colors very pretty, rather dark brown at the base but fading gradually to white, with a deep brown, sharply-defined ring on the basal half of the subterminal enlargement, the remaining half and the terminal filament white. Ceratophores of lateral tentacles continuous with frontal processes of head, on the same level as the median ceratophore but only $\frac{2}{3}$ as long and little more than $\frac{1}{2}$ as thick; styles twice the length of the prostomium, of nearly equal diameter to the median tentacles, and terminal filament constituting nearly $\frac{1}{2}$ of their length; ceratophore dark brown, contrasting strongly with the colorless prostomium, a very narrow terminal white ring, styles colored as on median tentacle. Palpi reach to base of terminal filament of median tentacle, their bases broad, mostly concealed from above by the tentacular ceratophores and buccal parapodia, taper rapidly in a concave outline to a rather slender terminal half ending in a short filament; pale brown throughout.

Peristomial parapodia of the usual form. Tentacular cirri with styles similar to median tentacle in form and color, but with longer filament; the dorsal exceeds the ventral by the length of its filament and equals the median tentacle. There are 36 somites, exclusive of the pygidium, of which 35 are setigerous. Body smooth both dorsally and ventrally, the neural depression well marked and about as wide as the muscle ridges. No nephridial tubercles can be detected, but small dark spots in their usual position appear to be pores. Dorsum of the first 12 somites marked with brown spots of diminishing size, a small brown postanal spot, rest of body colorless.

The 2d parapodium (1st setigerous) is, as usual, shorter and its ventral cirrus longer than the others, but is peculiar in this species in that it is widely separated from the 3d and projects forward by the side of the mouth. Its ventral cirrus is quite distinct from the foot, and arises from a lobe which is carried forward to a position partly beneath the base of the palp, so that it actually arises between the tentacular cirrus and the palp. Typical parapodia moderately developed, with short, thick, obtuse neuropodia and fairly well-developed notopodia occupying the usual position; neuropodial aciculum especially stout, a slight angulation of the foot at the point of its emergence. Dorsal cirri with prominent postero-dorsal ceratophores and stout erect styles with a slight subterminal enlargement and flowing terminal filament; each marked at about the middle with a blackish-brown ring; if depressed they would reach just beyond the tips of the ventral setæ. Toward the posterior end they become more slender and lose the subterminal enlargement; the last 3 diminish rapidly in length, and are carried horizontally behind with the pair of anal cirri, which are similarly formed, but the largest appendage of the body, and in addition to the middle brown ring, have a narrow basal one.

The 18 pairs of elytra occur on II, IV, V, and every alternate somite to XXVII inclusive, then on XXVIII, XXX, XXXI and XXXIII. The first is orbiculo-quadrate, the next two slightly emarginate, the following ones obliquely ovate with the posterior internal margin more strongly convex than the antero-external; the point of attachment is a little caudad of the middle of the long axis and somewhat toward the antero-external border. A dense fringe of cilia extends over about $\frac{1}{2}$ of the lateral margin of each, principally that part which projects freely at the sides; the entire dorsal surface is thickly covered with small angulated or prismatic papillæ with thickened cuticle, which are very densely aggregated in a narrow zone contiguous to the ciliated margin of the scale; 1 or 2 papillæ of the same form but 4-5 times as large may also be present. The 1st scale is peculiar in the character of its papillæ, many of which are tall, slender cones of various sizes, about five or six of them being very large, with a height almost equal to the short diameter of the scar. A few similar but smaller papillæ may occur on the 2d, 3d and last scales. Most of the elytra have merely a small but very conspicuous brown spot over the place of attachment, but the anterior ones are blotched, and the posterior speckled, with brown.

Notopodial setæ colorless, in 2 groups, the anterior of about six, very short, stout, strongly curved, with a short smooth tip and

strongly serrate convex margin, the teeth becoming smaller basally. Those of the posterior and more ventral group more numerous and about 4 times as long, relatively slender, pointed, straight or slightly curved, closely and doubly pinnate with short fine processes. Neuro-podial setæ about 20, in 2 irregular vertical rows, rather stout, slightly bent but scarcely enlarged at the end, the long smooth, simple, slightly curved point nearly as long as the serrated portion, especially on the ventralmost setæ; teeth of terminal row very large and prominent, followed by from 5-9 rows of smaller ones diminishing toward the base.

Known from the type only, Totomi Sea, 3,729, 34 fms.

Hylosynda carinata sp. nov. (Pl. XXIII, figs. 16, 17.)

A large species here described from an anterior fragment, consisting of the prostomium and 26 anterior somites, with a length of 26 mm. and a breadth of 10.5 mm. between the setæ tips of X, where the body has a width on the ventral surface of 6 mm.

Prostomium very short, twice as wide as long, though this ratio may be due in part to contraction; anterior margin with a deep median sulcus, on each side of which are the broadly rounded lobes that pass into the bases of the lateral tentacles; lateral margins strongly convex, and posterior nearly straight. Eyes 2 pairs, black, circular; the anterior facing laterad and slightly dorsad at about the middle of the lateral faces; posterior about $\frac{1}{2}$ the diameter of anterior, widely separated, but a little mediad of lateral, on the postero-lateral curvature of the prostomium.

Ceratophore of median tentacle arising from frontal sulcus, its length about equalling prostomium, stout, with a distinct terminal ring; style about $4\frac{1}{2}$ times the length of the prostomium, slightly enlarged near the end, then suddenly contracted into a short terminal filament, which, with the distal portion of the enlargement, is white, the rest, including the ceratophore, coffee-brown. Ceratophores of lateral tentacles continuous with frontal lobes, $\frac{2}{3}$ the length of median ceratophore, and of the same shape and color; style similar to median style but more slender, and the relatively longer terminal filament reaching to the beginning of the white zone of the median style. Palpi a trifle longer than lateral tentacles, the base stout, their greatest diameter about $\frac{1}{2}$ prostomium, the terminal half rather slender with a very short terminal filament; longitudinal ciliated ridges very strongly developed, 2 medial, and 1 each dorsal, lateral and latero-ventral; surface marked by irregular wrinkles which are of a much deeper brown color than the intervening areas. Pharynx stout, short, when protruded equal to

the prostomium and first 5 somites only; the jaws as usual, no median tooth; papillæ $\frac{2}{3}$ large, bilobed.

Peristomial parapodium reaches level of median tentacular ceratophore; styles similar to tentacles in form and color; the dorsal slightly longer, the ventral equalling median in diameter and slightly exceeding lateral in length. Ventral surface of body smooth, the neural groove well marked, and anteriorly equal in width to the lateral muscle bands. Nerve cords in contact throughout length. Some of the somites are filled with purplish eggs.

Parapodia prominent, but their length not exceeding $\frac{2}{3}$ width of body. Neuropodia taper toward slightly divided end which slopes dorsad to a broadly rounded tip; anterior lobe slightly larger and receiving the aciculum; a slight subterminal constriction. Notopodium small but prominent, on dorso-anterior face slightly distad of middle of parapodium, supported by a strong aciculum and bearing a few setæ. The dorsal cirri have very prominent ceratophores which are erect, curved laterad and supported on posterior margin of dorsal surface of parapodia; they resemble the tentacular cirri in form, color and size and fully $\frac{1}{2}$ of their length reaches beyond the corresponding setæ. The ventral cirri arise from low ceratophores about opposite the notopodia; the styles are slender and reach to the subterminal neuropodial constriction.

Only a few anterior elytra remain. They occur on the usual somites, and are delicate and membranous, but rather firmly attached. The 1st pair is missing; succeeding ones are broadly and nearly regularly reniform, with small elliptical areas of attachment so near to the lateral margins that fully $\frac{2}{3}$ of each scale is free medially, permitting them to overlap broadly. Margins smooth and non-ciliate. Dorsal surface punctate with distant sensory spots, and smooth except for an anterior border, broadest at the emargination, bearing small, low, faintly keeled crowded papillæ; most of the scales bear a prominent, more or less serrate crest extending from a point just over the medio-caudad margin of the scar toward, but not to, the posterior margin; frequently a similar but slighter ridge runs from the main one at an angle of 30° – 45° laterad and caudad, or almost exactly in the direction of the dorsal cirrus of the following somite. The general surface of the scales is a delicate pale mottled brown, the crests a deeper brown.

Only 3 or 4 notopodial setæ occur in a small tuft which arises from the anterior surface of the base of the notopodium, and fails by a considerable distance to reach the end of the latter; they are rather stout for their length, slightly curved and tapering, but not sharp-

pointed, the outer half marked with transverse rows of rather coarse serrulæ. Neuropodial setæ in 2 or 3 vertical rows between ensheathing lips; pale amber color, free end enlarged for a greater distance on the ventralmost setæ, curved slightly dorsad, the tip bifid, the longer terminal process curved but not hooked, the ventral spur straight, large and continuous with the distal comb, transverse combs 12-17, and, with the exception of a few proximad of the enlargement, all with long teeth.

The station at which the type was taken is unknown; a fragment also occurs in the collections from Sta. 3,708, Suruga Bay, 60-70 fms.

Hylosynda magnacornuta sp. nov. (Pl. XXIII, fig. 18.)

A slender species described from a fragment consisting of the head and 26 somites.

Prostomium about $1\frac{1}{2}$ times as long as broad, but the prominent muscular ridges which extend from its sides to the peristomial parapodia make it appear much broader, about twice as broad as long if these are included in the measurement. A median dorsal groove divides both anterior and posterior margins, but fades out at the vertex, anterior lobes broadly rounded, continuous with the bases of the lateral tentacles. Eyes 2 pairs, widely separated, small, black; anterior pair slightly the larger, lateral in position and nearer the anterior than posterior margin of the head, scarcely visible from above. Posterior pair smaller, entirely dorsal, separated from posterior border by about twice their diameter and from each other by about 7 times their diameter. Tentaclestyles all lost, their ceratophores small, the lateral slightly more dorsal than the median and arising without any definite boundary from the anterior prostomial lobes; all sharply distinguished from the colorless head by thin deep chocolate bases. Palpi very large, about 6 times the length of the head and at thickest part more than $\frac{1}{2}$ its width, the base constricted at its point of origin beneath the prostomium, gradually thickened to the end of the first fourth and then tapered to the long slender tip. Proboscis protruded, equal to head and 1st 11 somites; besides the dark brown paired long claw-like jaws, there is a small, low, conical, nearly black median dorsal and a similar ventral tooth; papillæ $\frac{3}{8}$, sharp-pointed, scarcely bilobed.

Tentacular cirri lost. Ventral surface of body smooth. Neural groove about $\frac{3}{8}$ the width of the lateral muscle areas anteriorly, diminishing to $\frac{1}{2}$ posteriorly. The two halves of the nerve cord widely separated as far as somite XI or XII, then gradually approaching but not completely united within the limits of this specimen. Nephridial tubercles begin on V, soon becoming conspicuous and standing out

freely from the base of the parapodia. The last 7 somites present have their parapodia packed with whitish eggs.

Parapodia long, exceeding the dorsal width of the body except at its widest part, slender, tapering with a gentle curve to the slightly bilobed tip, the distal end oblique with a rather acute dorsal angle. The neuropodium, which forms the greater part of the parapodium, as just described, is divided by a vertical cleft into two plates, which are not so widely separated as in *Scalesetosus*, though that condition is approached anteriorly; anterior lobe the larger and receives the end of the rather strongly curved aciculum. The notopodium is a rudimentary nipple-like process which bears no setæ but receives the end of a slender aciculum. No important variations of the parapodia beyond the usual diminution in size occur toward the ends of the body.

Except for a minute regenerating one on XV all of the elytra have been lost.

The neuropodial setæ are perfectly colorless, delicate and brittle, but not especially slender in proportion to their length; the end rather abruptly enlarged, slightly curved and tapering to a bifid extremity, the terminal process of which is larger and slightly hooked; immediately proximad of the 2d one or spur are 9-14 short transverse combs, the teeth of which are minute distally but in the proximal rows exceed the diameter of the seta. There are no notopodial setæ.

Type, Sagami Bay, 3,698, 153 fms.

APHRODITIDÆ.

Lætmatonice producta Grube.

Sagami Bay, 3,698, 153 fms.

Lætmatonice producta Grube var. ***benthaliana*** McIntosh.

Suruga Bay, 3,726, 26 fms.; Totomi Sea, 3,729, 34 fms.; North Japan, 3,772, 79 fms.; North Japan, 3,774, 81 fms.

Lætmatonice flicornis Kinberg.

A single specimen of this Atlantic species occurs in the collection from an unknown station. The setæ differ somewhat from those of specimens dredged off the American coast.

Lætmatonice japonica McIntosh.

Sagami Bay, 3,698, 153 fms.; Sagami Bay, 3,738, 167 fms.

Lætmatonice pellucida sp. nov. (Pl. XXIII, figs. 19, 20.)

This species belongs to the *producta* group, and if McIntosh's views concerning the subdivisions of the latter prove to be correct may have to be considered as a variety merely. The largest specimen measures

30 mm., and the type 26 mm. long, and 11 wide between the tips of the parapodia.

Prostomium a flattened spheroid, slightly wider than long, with a slightly elevated median area which fades away anteriorly and widens posteriorly, where it is continuous with the peristomium. Ocular peduncles about $\frac{3}{4}$ as long as the prostomium, from the anterior face of which they arise, the ends enlarged and globular, the bases narrow and stalk-like; no distinct eyes, but a slight discoloration of the ends of the peduncles. Median tentacle with a thick swollen ceratophore which fills the space between the ocular peduncles, and about equals the prostomium in length; the style excessively slender, filiform, scarcely tapered, at least 9 times as long as the prostomium, its extremity slightly bulbous, with a subterminal constriction and a second more proximal enlargement. Palpi very slender, regularly tapering, whiplash-like, fully 15 times as long as the prostomium. Facial tubercle prominent, extending from the base of median tentacle into mouth, covered with conspicuous papillæ arranged in rows.

Peristomium short, coalesced with median portion of prostomium above, and united with somites II and III to form a broad quadrate postoral plate below. Setigerous somites 33, very indistinctly limited except at the bases of the parapodia; the surface quite smooth except on the postoral plate and the region immediately following, which are covered with globular papillæ of much smaller size than in many other species. The integuments are extremely transparent, so that the internal organs, and particularly the arrangement of the alimentary canal, nervous system and the masses of germ cells, can be clearly seen. The retracted proboscis reaches to somite XVI.

Parapodia of the usual form, with only a few very small spherical papillæ on the ventral surface; notopodia short, conical, directed nearly vertically on the scale-bearing, horizontally on the cirri-bearing somites; neuropodia long, very slender, and truncate at the end. Dorsal cirri of the same form as the median tentacle, equalling or exceeding the width of the body, and reaching far beyond the ends of the setæ. Ventral cirri short, about $\frac{1}{4}$ the length of the neuropodium, slightly tapering, blunt-pointed. Peristomial parapodia directed straight forward by the sides of the head, and nearly twice as long as the prostomium with its ocular peduncles. At its end a spreading tuft of capillary setæ arises from the inner side and occupies the space in front of the head, while from the outer face the tentacular cirri spring at right angles and then curve forward; they have form of the dorsal cirri, but are scarcely half their length, and much less than the median

tentacle. The first few neuropodia are shorter and stouter than the others, and the ventral cirri relatively longer; the last 3 parapodia are much reduced in size.

The elytra are fully exposed and, except the last pair, large, nearly elliptical, but with a slight emargination at the point of attachment on the lateral margin, from which point they extend inward and meet in the middle line but do not overlap in full-grown specimens; they are perfectly smooth, gelatinoid, pellucid and exhibit internally a peculiar fibrous structure closely simulating the appearance of the lacunæ and canaliculæ of bone tissue. Fifteen pairs occur on II, IV, V and succeeding alternate somites.

Dorsal felt fibers are entirely absent, and the spines are so few and small as to give to the species a characteristic unprotected aspect. The following is the arrangement of the setæ on a typical elytriphorous somite of the middle body region. The notopodial aciculum projects obliquely caudad and laterad, forming a pointed prominence, just within which a tuft of light golden spines spreads through the emargination of and over the dorsum of the elytron. These spines are few in number, and remarkably small and slender, both of which conditions may be due to the loss of the longer spines. They have the usual tapering, hollow stems, with the protuberances few in number and of unusually large size, the spear-head flattened, long and acute, with 2 or 3 additional barbs on one side and 3 or 4 on the other. On the ventro-posterior part of the notopodium is a tuft of delicate, flexible, finely striated, hair-like setæ which spread chiefly downward and outward over the anterior face of the succeeding parapodium. Neuropodium supported by a stout central aciculum about which are grouped 6 or 8 rather stout, rich brown setæ, with long hollow shafts striated both longitudinally and circularly, the outer $\frac{1}{3}$ or $\frac{1}{4}$ bent, with a prominent spur at the convexity, beyond that tapering and provided with a single close row of very long hairs, the terminal ones of which envelop the slightly curved point. Cirriferous parapodia differ chiefly in the absence of dorsal spines and in having the capillary setæ coarser, stiffer, more numerous and spreading in a horizontal plain from a short line on the dorsal surface anterior to the dorsal cirrus. A tuft of such setæ occurs on the peristomial parapodia; on II the neuropodials are slender, and doubly fringed, and similar ones occur on III; those of IV, however, are typical.

Color pinkish.

Bering Sea, 3,784, 85 fms.

***Aphrodita australis* Baird.**

This, the representative in the Australian seas of our well-known sea mouse, has not been recorded hitherto from Japanese waters.

Sagami Bay, 3,696, 501–749 fms., and 3,697, 120–265 fms.

***Aphrodita japonica* v. Marenz.**

Von Marenzeller describes the ventral spines of his specimen as smooth, a condition which I have assumed to have resulted from the wearing away of the hairs present in all three of the "Albatross" examples. The palpi are also longer in the latter.

Sagami Bay, 3,698, 153 fms.; Sagami Bay, 3,704, 94 fms.; Suruga Bay, 3,713, 45 fms.

ACETIDÆ.**RESTIO gen. nov.**

Both median and paired tentacles entirely absent; palpi well developed; ommatophores wanting or completely coalesced with the sides of the prostomium so that the eyes are sessile; peristomial palpi without setæ; setæ in general resembling those of *Eupanthalis*.

Restio ænus sp. nov. (Pl. XXIV, figs. 21–24.)

Represented by an anterior end consisting of the prostomium and 41 somites, probably the greater part of the worm, and measuring 35 mm. long, and 5.2 mm. in total width, which is remarkably constant.

Prostomium slightly wider than long, broadly bilobate anteriorly where a slightly median sinus divides it into two broadly rounded lobes from which the slides slope caudad to the somewhat narrower, straight posterior border. There are two pairs of eyes, of which the first are very large, black, cup-shaped, with a lens-like central thickening, and face directly forward, being situated on the anterior face of the prostomium close to the lateral angles. The posterior have a diameter of only $\frac{1}{3}$ the anterior, are black, circular, without lenses, and are situated on the sloping lateral faces of the prostomium, from which they look outward and caudad across the pit to be mentioned below. From between the eyes of each side a translucent membranous process reaches laterad to, but not uniting with, the peristomial parapodia. There is not the slightest trace to be seen of median or paired tentacles, nor of the scars which they should leave if accidentally broken away, although the front of the head was examined with very great care under favorable conditions. The palpi have been lost, but very distinct scars remain beneath the anterior eyes on the extreme lateral part of the anterior

face of the prostomium; the distance between them is $1\frac{1}{2}$ times their diameter.

Peristomial somite very distinct, its parapodia simple and extending straight forward by the side of the prostomium, with which they come in contact between the two pairs of eyes by means of their swollen anterior ends; elsewhere they are separated from the head, thus leaving a pair of deep pits between. Tentacular cirri lost, but leaving deep scars. Although the total width is nearly uniform, the body alone tapers continuously from the peristomium caudad, being very slender posteriorly; at VI it is $2\frac{1}{2}$ times as wide as the parapodia are long; at XX they are about equal, and behind XXV the width of the body does not exceed $\frac{2}{3}$ the length of the parapodia.

The parapodia following the peristomial exhibit a number of features of interest. The next six are broad and very short, and so close to the ventral surface of the body that the regular arched surface of the dorsum is scarcely broken by them. The next (VIII) is decidedly longer, and from this on to XXIV they continue to increase gradually in length but very little in breadth. Beyond XXIV they are stout and thick, and exceed in length the diameter of the body, with the dorsal and ventral surfaces of which they are continuous; their thickness in this region is a result of their distension by sperm masses. The anterior parapodia have the neuropodia broad and divided into pre- and postsetal lobes, of which the former is again divided into dorsal and ventral processes; the notopodium is altogether wanting on the 1st, but on the others is represented by a tubercle of increasing size, into which the aciculum enters. On somites IX to XX the notopodium forms a rather conspicuous broad flap, which passes down the dorsal half of the anterior face of the parapodium, and from behind which the capillary setæ arise in connection with the integumental attachment of the fiber gland. The dorsal angle of the neuropodium is prominent, rounded and achæitous; the ventral angle is enveloped by the lower end of the postsetal fold. The notopodium becomes gradually reduced in size, and once more shifts to a dorsal position and loses its setæ; by XXV it is a mere dorsal papilla into which the aciculum enters and so remains to the end.

Only two elytra remain on the specimen, but at least 12 pairs of functional elytophores are present on II, IV, V and every alternate somite to XXIII inclusive; posterior to this small elevations occur on every alternate foot, but it is doubtful if they bear elytra. The two scales present are small, not nearly meeting in the middle line, delicate, circular, low funnel form, the margins wrinkled; they bear no papillæ

nor cilia, but the interior is apparently divided by delicate plates into irregular polygonal cells, the largest of which are marginal.

Four forms of setæ occur on typical somites (X). Those of one kind are colorless, long, slender, curved and tapering, bear rather distant opposite pairs of slender awn-like spines, and have slightly enlarged bases not shown in the drawing (fig. 24); these are arranged in a single long vertical row which extends nearly half-way down the anterior face of the foot, and are attached to the notopodial fold which largely covers them anteriorly; they do not occur caudad of XX. Behind these is a second vertical row of stouter colorless spines, slightly enlarged subterminally and then tapering and fringed; few perfect examples of these have been found and none occur as far caudad as XXVI, and still farther back the first-mentioned capillary setæ are also wanting. A third vertical row contains setæ of two kinds and, with certain changes in number and arrangement, is constant on all parapodia. Five or six pale yellow, short, stout setæ occupy the dorsal end of the bundle in more anterior, and the middle in more posterior somites; they present a subterminal enlargement, and a peculiarly roughened slightly hooked tip continued into a densely hairy filiform appendage and guarded by a dense brush of very stiff hairs; usually the capillary tips and much of the guard have been worn away, and possibly the tip is normally absent posteriorly. Ventral to these in anterior, and both ventral and dorsal in posterior, somites is a group of colorless more slender setæ, with broad lance-shaped ends and transverse rows of fine bristles which become larger on the dorsal side.

Besides the true notopodial and neuropodial acicula, fiber glands are found in relation to all parapodia from somite IV to the end of the body, although the chitinoid rope is conspicuous only between X and XXV. In structure they resemble very closely Eisig's figures of *Polyodontes*, that of XVI, for example, consisting of a dense strand of chitinoid fibers of iridescent brassy color, enveloped in a cellular sheath and measuring 15 mm. long by .3 mm. in diameter. The free internal end gradually tapers, the cellular sheath at the same time becoming thickened and finally terminating in a slightly bulbous mass of cells, from which the gradually forming fibers may be traced. The outer end presents a rather considerable spherical enlargement of about twice the diameter of the strand and composed of a dark granular matter (cells?). It is attached to the integument at the bottom of the postnotopodial groove from which the most anterior row of setæ arises, and when forcibly pulled away entire some of these come with it. The strands pass into the coelom, the anterior ones usually arranged horizontally by the

side of the pharynx, the smaller posterior ones coiled in about 2 turns in the base of the foot.

Type only, Suruga Bay, 3,707, 63 to 75 fms.

SIGALEONIDÆ.

Thalanessa oculata McIntosh.

Sagami Bay, 3,702, 31-41 fms.; 3,704, 94-150 fms.

Leanira areolata McIntosh.

Sagami Bay, 3,695, 3,696, 3,698, 153 to 749 fms.

Leanira japonica McIntosh?

An incomplete specimen is doubtfully referred to this species, from which it differs considerably in the shape of the elytra.

Totomi Sea, 3,731, 55-65 fms.

EUPHROSYNIDÆ.

Euphrosyne superba v. Marenz.

The single example which represents this species has only 7 pairs of branchiæ to each somite.

Suruga Bay, 3,717, 63-100 fms.

AMPHINOMIDÆ.

Chloëia flava (Pallas) De Blain.

This splendid annelid was collected in some numbers in 8 fathoms at Tatyama, Japan.

PHYLLODOCIDÆ.

Eumidia cæca sp. nov. (Pl. XXIII, figs. 1, 1a.)

A complete worm has 187 segments, and measures 88 mm. in length and 4 mm. between the tips of the parapodia at the middle of the body. Somewhat depressed, tapering about equally from the middle to both bluntly pointed ends.

Prostomium as viewed from above nearly circular, the postero-lateral region somewhat encroached upon by the sides of the peristomium. Eyes absent, but a dark spot near the center of the dorsal surface. Frontal tentacles short, less than the transverse distance between them, stoutly fusiform with the tip acute, those on each side very close together, the ventral somewhat more caudad and about $\frac{1}{2}$ longer than the dorsal. Median tentacle very short, at extreme posterior margin of peristomium. "Palpi," short lobes bounding the mouth laterally and apparently connected with the peristomial somite.

Peristomium of two united somites, about twice the width of the head and equalling it in length, encircling the prostomium as a promi-

nent fold which encroaches on it laterally, but emarginated dorsally to accommodate the median tentacle. The anterior half of the peristomium bears the first tentacular cirrus and more ventrally the so-called palpi. Tentacular cirri rather short and stiff, with very short ceratophores; the styles of the first conical, obtuse, with a length scarcely exceeding the width of the prostomium; those of 2d peristomial somite lanceoloid, acute; the dorsal one 3 times the length of the 1st and reaching to somite X, the ventral $\frac{3}{4}$ length of latter and reaching to VII; tentacular (dorsal) cirrus of 3d (1st setigerous) somite equal to preceding dorsal tentacular cirrus, and reaching to XI. Remaining somites well marked, strongly arched above, flattened below, increasing in length to middle of body. Caudal end blunt, without cirri in this specimen. Almost entire body, except a few anterior somites, filled with eggs.

Parapodia uniramal throughout, all parts more or less foliaceous, least so anteriorly. Neuropodium flattened antero-posteriorly, the presetal lobe much the larger, broadly rounded and divided by a narrow cleft at apex, postsetal lobe very short. Ventral cirrus leaf-like, broadly ovate, the apex obtuse, much larger than neuropodium, posteriorly overlapping and extending beyond it, obliquely attached by basal half of dorsal margin to a flattened lobe-like process from the ventral side of the neuropodium. Notopodial cirrus reniform, with a deep sinus; long diameter, which is directly oblique to longitudinal axis of body, twice short diameter; posteriorly they are more rounded, overlapping from before backward, covering parapodia and leaving the dorsum of body only exposed; ceratophores very broad, flattened, slightly curved dorsad, with a wing-like ventral process which probably represents the notopodium, but receives no aciculum. Form of parapodia very constant throughout entire length of body, the anterior ones becoming smaller and the last three at the caudal end simplified.

Setæ all of one kind, arranged in a broad fan-shaped fasciculus, colorless, compound, shaft very gently curved, slightly enlarged at end; socket narrow, its wall deeply cut away on one side and slightly thickened at that point to form a seat for the slender base of the appendix, elsewhere high and provided on each side with one large and three or four smaller teeth; appendix very delicate, elongate, attenuate, normally straight, though often curved in preparations, the back thickened, the edge knife-like and rather remotely serrulate with small short teeth.

The color is partially preserved; a rather broad band equal to $\frac{1}{4}$ width of back, of reddish-brown, marks the median dorsal region, be-

coming of a richer more purplish color anteriorly and there terminating abruptly in a spot which includes the entire dorsum of the 7th to 10th setigerous somites. A spot of the same brown color occurs on the medial half of each dorsal cirrus. Otherwise the entire body and especially the cephalic region is of a brilliant white.

Type specimen only; Sagami Bay, 3,702, 31-41 fms.

Phyllodoce grœnlandica (Oersted) Mgrn.

A small example of 80 mm.

Suruga Bay, 3,707, 63-75 fms.

NEREIDÆ.

Nereis pusilla sp. nov. (Pl. XXIV, figs. 25, 26, 27.)

The type specimen, consisting of 50 somites, measures 20 mm. long and 2.2 mm. between the tips of the parapodia at the widest point.

Prostomium longer than wide, the preocular portion little narrower than ocular, anterior margin broad, truncate, lateral margin little excavated for palpi. Eyes two pairs, large, conspicuous, black, apparently posterior only with cuticular lenses; posterior on extreme hinder margin of head, circular; anterior somewhat larger, more widely separated, at bases of palpi, elliptical. Frontal tentacles widely separated at base, conical, length much less than ($\frac{2}{3}$) distance between posterior eyes. Palpi prominent, as long as prostomium, terminal piece short, conical.

Peristomium $\frac{1}{2}$ prostomium above, $\frac{2}{3}$ as long laterally. Tentacular cirri rather short, slender, non-articulate; posterior dorsal reaches to V, anterior dorsal to IV, and both ventral ones to III. The following somites are long, the anterior ones equalling the peristomium in length.

Parapodia slender and very prominent, after the 12th about equaling the width of the body. The 15th parapodium has the base about as long as deep, the notopodium larger than neuropodium, which it slightly overlaps anteriorly; notopodium divided into two long, pointed, conical, dorsal to ventral lobes, between which the setæ arise, and a very slightly shorter slender, presetal lobe; the notopodial cirrus very slender, arising from the swollen basal $\frac{1}{3}$ of the dorsal notopodial lobe, and reaching scarcely beyond the tip of the latter. Neuropodium consisting of an elongated conical ventral lobe and a slender setigerous lobe which divides at the end into a short broad presetal and a very long slender postsetal process, the latter extending slightly beyond any other portion of the foot; neuropodial cirrus small and slender, its origin well separated from base of neuropodium, and its tip failing to

reach the middle of the ventral neuropodial lobe; the slender black acicula are parallel, the neuropodial slightly the longer.

Anteriorly the parapodia become shorter and on the first and second the notopodial setigerous lobe is lacking, the notopodial cirrus becomes relatively shorter and the neuropodial longer than on the typical foot, so that the ventral is the longer on the first and has its base constricted and the cuticle in that region much thickened. Posteriorly all of the lobes become even more slender and elongated, the neuropodium and notopodium are even more closely appressed, the neuropodial cirrus more widely removed and so much diminished in size that it scarcely reaches to the base of the ventral lobe, while the dorsal cirrus retains its characteristic length.

Setæ all compound, nearly colorless and very transparent. Notopodial all alike, the stems slender and very regularly camerated, the terminal socket symmetrical, blade remarkably slender, with capillary tip and short fine hairs on the concave margin of the basal $\frac{2}{3}$; those in the dorsal part of the vertical row with much longer blades than the ventral ones; similar setæ occur in the dorsal and posterior part of the neuropodium. In the ventral region of the neuropodium are a few short-bladed compound setæ; their stems rather stouter but camerated in a similar regular manner, the end more enlarged, the socket oblique, the long limb of its margin receiving the septate cavity which is here divided by a longitudinal partition; the blade hooked, guarded and provided with very stiff hairs directed distally. Several stouter setæ of this type occur in the anterior dorsal part of the neuropodium, but, except for their slightly shorter blades, they differ in no noteworthy manner from those just described.

Exposed portion of maxillæ brown, relatively short, broad, acute, the edge with 3 teeth in the basal half separated by a wider interval from a 4th double tooth near the apical fang. Paragnathæ brown, small, conical, all separate, the posterior ones in each group somewhat larger; group I, 5 in longitudinal series, the first minute, increasing in size caudad; II, oblique elliptical areas, in 3 ranks, anterior lateral of about 4, very small, middle of 6 larger, posterior internal of 5 still larger; III, a small longitudinally elongated group of 10-12; IV, nearly circular areas of 18-24; the basal circle absent.

Head and anterior segments delicate rose-red, brightest on head and gradually fading posteriorly. The specimens are immature, but differ from all described species, especially in the character of the paragnathæ and feet.

Two specimens, Suruga Bay, 3,707, 63-75 fms.

Nereis paucidentata sp. nov. (Pl. XXIV, figs. 28, 29, 30.)

The type and only specimen is complete but in several pieces, which have a total length of 95 mm., with a maximum width of 6 mm. at XV. There are 118 fully developed somites and a small caudal tip of 6 regenerating ones.

Prostomium slightly broader than long, broadly rounded anteriorly, where it is about $\frac{1}{2}$ the greatest breadth across the anterior eyes, broadly excavated at the sides for the bases of the palpi. Eyes 2 pairs, both with cuticular lenses, large, the anterior slightly the larger and farthest apart. Frontal tentacles short, awl-shaped, about equal in length to the distance between the posterior eyes. Palpi reaching to tips of frontal tentacles, the bases stout and swollen, the styles nearly spherical, knob-like, partly retracted into ends of bases, and about $\frac{1}{4}$ diameter of these.

Peristomium dorsally nearly $\frac{1}{2}$ length of prostomium, its enlarged lateral part $\frac{2}{3}$ as long. Tentacular cirri rather short, the styles more or less distinctly articulated, posterior dorsal reaching VI, anterior dorsal V, posterior ventral III and anterior ventral II.

The form of the somites presents nothing characteristic and the caudal cirri are wanting.

The parapodia resemble those of *N. dumerilii*, but the lobes are more prolonged, and the dorsal cirrus has a more basal origin throughout the series. The typical foot presents four principal elongated subequal lobes, with a slender notopodial cirrus, about twice the length of the lobes, arising from the swollen region near the middle of the dorsal margin of the foot, and a neuropodial cirrus, about equalling the ventral lobe, from which it is separated by a short interval. The neuropodium consists of a rather truncate setigerous lobe, bearing a broad presetal process, into which the aciculum enters, a much longer and more narrow conical postsetal lobe, and a slender, conical, ventral lobe. The notopodium is separated from the neuropodium by a deep narrow cleft, and consists of 2 slightly divergent, elongated, conical, dorsal and ventral lobes, between which the setæ arise, guarded by a shorter, flatter, presetal process, which is more closely connected with the ventral lobe. Anteriorly the notopodial presetal process diminishes in size and disappears entirely, with the setæ, on the second foot; the setigerous lobe of the neuropodium undergoes little change, but the ventral lobe becomes large and thick, and more closely united with it. The first and second parapodia have the dorsal non-setigerous lobe only of the notopodium, and the ventral lobe of the neuropodium considerably larger than the setigerous lobe and broadly rounded at

the end; the dorsal cirrus is $1\frac{1}{2}$ times the length of the notopodium and the ventral slightly longer than the neuropodium. Posteriorly the notopodium increases relatively in size, giving the entire parapodium an oblique aspect, at the same time becoming much more vascular and contractile, which greatly affects the relative proportion of parts in neighboring parapodia. Otherwise they undergo little alteration.

The setæ are all compound and three forms occur. The notopodials are all similar, with slender, strongly and closely camerated shafts, symmetrical sockets and long, straight, slender, tapering and strongly fringed blades. In addition to the setæ of the notopodial kind which are the most numerous dorsal to the aciculum of the neuropodium, the latter bears two other forms of compound setæ. In the ventral part of the foot are some rather stouter ones, in which the shafts are camerated and the sockets oblique, the fringed blades much shorter, broader, hooked and guarded at the apex. Two or occasionally 3 much stouter deep yellow setæ project stiffly from a point just dorsad of the aciculum; the camerated interior of the shaft is marked by a central line, perhaps due to perforations in the septa, its end bears a shallow oblique socket, and the very short blade, which is very seldom present, is strongly hooked, striated, guarded and furnished with a marginal fringe of long hairs.

Maxillæ brown, broad, not especially acute, abruptly oblique at end, each with 8-9 teeth in addition to the terminal fang, from which they are separated by a short interval. Paragnatha almost obsolete; maxillary ring: I, wanting; II, 2-4; III, 1; IV, 2; a very minute one on each side between III and IV; basal ring represented by three small teeth arranged in an arc on the ventral side; all are small, low conical and brown.

One specimen, type, north of the Aleutian Islands, 3,785, 270 fms.

Nereis pelagica Linn.

Sagami Bay, 3,700, 63 fms.; Totomi Sea, 3,729, 34 fms.

NEPHTHYIDÆ.

Nephtys brachycephala sp. nov.

None of the specimens is complete, the type and most perfect one having 60 segments and a length of 64 mm., the maximum breadth between the tips of the parapodia being 4 mm. at X. Body relatively slender, not depressed, anteriorly nearly round, but venter somewhat flattened; posteriorly nearly quadrate.

Prostomium very short, twice as wide as long, deeply sunken (about $\frac{1}{2}$ of its length) in peristomium, roughly oblong, with anterior angles slightly truncated, lateral margins slightly convex, anterior gently

concave, and posterior straight. Eyes absent. Tentacles very short, the lateral slightly the larger and about $\frac{1}{3}$ length of prostomium, both pairs borne close together on the truncate lateral angles, directed nearly straight forward, but slightly divergent.

Parapodia short, especially anteriorly, the two rami widely separated, least so in the middle region, where the branchiæ are highly developed. Neuropodium and notopodium about equally developed throughout, the former directed laterad, simple, truncate, conical; with slight acicular lobe and circumsetal collar, but no distinct lamellæ; cirrus very short, thick, conical, arising from ventral side of neuropodium close to base. Notopodium directed somewhat obliquely dorsad, also of simple, short, truncate, conical form, without lamellæ; acicular lobe well-marked and notched at end; circumsetal collar oblique, its posterior portion high, the anterior very low. No dorsal cirrus, but a special cirrus of short thick form on ventral side of notopodium, in the branchiate segments closely connected with the external side of the base of the branchial stem.

Branchiæ begin on V, as a minute process on the ventral and internal side of the cirrus; this increases in size and develops dorsal and ventral wings, which assume the characteristic form by XV, though continuing to increase in size for some segments beyond. In its typical development the branchia is extremely like *N. phyllobranchia* McIntosh, but the shape of the prostomium readily distinguishes the two species; the branchia is a large wrinkled leaf-like structure, through the middle of which runs a thick tapering midrib, the tip of which projects slightly, and from which vessels pass into the expanded portion. When best developed it occupies most of the space between the two rami. Posterior to XXXV the branchiæ undergo reduction until the much shortened midrib alone remains, bearing a minute process, probably the cirrus, on the dorsal side of its base.

The setæ are almost entirely destroyed, but their dark-colored bases remain to indicate their arrangement. Anteriorly they are disposed in both rami in rings around the acicula as centers, the posterior semicircle being composed of large, the anterior of small, setæ which soon disappear, leaving only the posterior arc in parapodia farther caudad. None of the setæ are complete, but enough may be seen of those of the anterior semicircle to show that they are camerated and very small and delicate. Nothing whatever can be determined of the characters of the posterior ones. A single slightly brownish, acutely pointed, stout aciculum supports each ramus.

Sagami Bay, 3,695, 175-190 fms.

***Nephtys ciliata* (Müller) Rathke.**

This species was dredged in large numbers in Avatcha Bay, Kamchatka, in 12 to 15 fathoms, on a bottom of stiff green mud. A specimen from north Japan (3,775), taken in 57 fathoms from a bottom of similar character, has much longer setæ and larger cirri.

EUNICIDÆ.***Eunice northioidea* sp. nov. (Pl. XXV, figs. 36, 37, 38.)**

The type is in two pieces, probably representing the greater part of the worm, and together including the head and 86 somites measuring 58 mm. in length and 3.5 mm. wide. The body is very little depressed and of nearly uniform diameter throughout the region represented, the dorsum very high and convex, the venter nearly flat, with a deep neural groove. Owing to a rather strong forward tendency of the anterior feet this end of the worm presents a slight resemblance to *Northia* and its allies, which is heightened by the pearly-white color of the greater part of the dorsum of VI.

Prostomium strongly retracted within peristomial fold, concealing about one-half of its length, which is $1\frac{1}{2}$ times the length of the peristomium, shape about as in *E. mucronata*, the frontal tentacles much less divergent than in *E. quinquefida*, their terminal joint rudimentary. Eyes one pair, large, brown, below base of inner and behind outer lateral tentacles. Tentacles strongly and nearly regularly beaded in the terminal portion, the constrictions becoming fainter toward the base. In the condition presented by this specimen the median and inner lateral tentacles are subequal, the former touching VIII, the latter reaching into VII, and the outer laterals just touch IV. The basal articulations of all are rather more distinct than in the other species herein described.

Peristomium with a wide free anterior fold above, its longest part not lateral, as usual, but ventral, owing to the unusually large size and prominence of the mandibular lobes. Second somite longest dorsally, where it equals $\frac{1}{3}$ the peristomium; its cirri long, slender, beaded, reaching tip of head anteriorly, and to middle of VI posteriorly.

Parapodia essentially as described for *E. quinquefida*, but more ventral in position; dorsal cirri about as long as in that species, but more distinctly articulated, the sense-organ moderately developed; pigmented spots at bases of both dorsal and ventral cirri.

Branchiæ begin on IV as a slender process, which by VIII nearly equals the dorsal cirrus on one side, while on the other it is bifid and nearly as long; they are trifold on both sides on XI, quadrifid on XV

and so continue, with occasional variations to three divisions, to XXII on one side, and XXIII on the other, then again trifold to XXVII, bifid, or occasionally trifid, to XXXII; from this point a single filament, which is at first larger than, but gradually decreases until it only equals, the dorsal cirrus, continues to the posterior end of the piece. Although the same bifurcate mode of branching as in *E. quinquifida* occurs, the aspect of the gills is totally different; the branches are thicker, stiffer and, instead of bending toward the middle, stand erect, but the parapodia are placed so low down that they scarcely arise above the level of the back.

Setæ fewer than in *E. mucronata*, generally stouter and more regularly arranged in horizontal rows. All are colorless.

Compound setæ with shafts thickened gradually at the end for a distance considerably exceeding the length of the appendix, here with strongly marked oblique striations and the dorsal margin distinctly denticulated over a considerable distance; appendix short, the length 4-6 times its width, with a well-marked subterminal constriction and a bifid tip, the terminal tooth slightly hooked, the other broad, straight, acute; guard broad, without mucronate tip, closely following outline of terminal tooth, beyond which it extends slightly on the dorsal side. As usual the appendages are relatively longer on anterior and shorter on posterior parapodia.

Capillary setæ about $\frac{1}{3}$ longer than the compound, rather strongly curved, and tapering only in the terminal $\frac{2}{3}$ of the exposed portion, but then to an excessively acute point.

Spatulate or paddle-shaped setæ rather more than $\frac{1}{2}$ length of capillary setæ, by which they are concealed from above; situated caudad of the acicula and ventrad of the capillary setæ, tapering gently to little expanded ends which have about nine points, both marginals being produced, but very unequally, the anterior one apparently always the longer.

The acicula are deep brown, practically black, in color, and opaque except at the smaller ends; the ordinary ones are two in number, subequal, bluntly tapered, and slightly curved at the end. In the posterior somites, beginning at about XL, is a single ventral uncinuate aciculum of rather strongly sigmoid curvature and with a bifid hooked end. They are always thickly incrustated with a reddish-ocherous deposit, the removal of which destroys the guards.

Jaws hoary brown, the thin plates yellow; maxillæ stout, strongly hooked and curved ventrad near the broad base, which is provided with a prominent tubercle for muscular attachment; carrier broad, not

constricted. Next pair of dorsal jaws triangular with the two posterior angles prolonged, and the anterior angle provided with a strong, somewhat hooked tooth supported by a small anterior one, and succeeded on the left, which is the larger of this pair of jaws, by four, and on the right by three, somewhat unequal teeth, while the remaining posterior third of the medial side is edentulous. The anterior group of dorsal jaws includes four pieces on the right, and three on the left side arranged in arcs; the most external on each side is a small toothless plate; the next bears one tooth. The next, which is the most anterior of the group, is supported by a small, deep brown plate with a larger thin yellow extension; on the right side it bears 8 teeth, and an internal slightly serrated ridge; on the left it is much shorter, and bears but 6 teeth, but is supplemented by the fourth jaw plate, which fits inside of its posterior end, is of an elongated crescentic form and bears about 12 teeth. The mandibles are remarkably prominent, the two halves freely movable on each other, the whitish calcareous pieces less than $\frac{1}{2}$ the length of the slender yellow carrier, strongly divergent, irregularly oval in form, with four ridges and as many obscurely indicated marginal teeth, the anterior angle prominent, almost hooked.

Suruga Bay, 3,718, 65 fms.

Eunice vittata Della Chaije.

Quite common at station 3,707 in Suruga Bay in 65-75 fms.

Eunice quinquifida sp. nov. (Pl. XXV, figs. 39, 40, 41.)

The single specimen representing this species is incomplete, consisting of the head and 56 somites measuring 45 mm. long and 4 mm. between the tips of the parapodia.

Prostomium about twice as wide as long, very deeply cleft in front and the frontal tentacles so strongly divergent that in ventral view it appears to be formed of two broadly pyriform halves connected at their apices by a rather narrow posterior band, terminal pieces of frontal tentacles even smaller than usual. Eyes, 1 pair, large, brown, in the usual position and largely concealed by the free anterior border of the peristomium. Tentacles all irregularly and boldly articulated, rather short, tapering; the median evidently imperfect, the inner lateral reaching to VIII, and the outer lateral to III. Peristomium very long, especially on the sides where, with its broad anterior lobes, it much exceeds the prostomium which it dorsally encloses as far as the bases of the tentacles in a prominent fold uniting with the sides of the prostomium below the eyes as far forward as their anterior borders.

The second somite is very short, not more than $\frac{1}{3}$ of the peristomium,

from which it is imperfectly separated laterally, and only about $\frac{1}{3}$ as long as somite V; tentacular cirri tapering, rather faintly articulated in the terminal half, reaching anteriorly to the cephalic margin of the peristomium and posteriorly to V. Body little depressed, strongly convex even in the branchial region, and with a very strongly marked neural groove. Length of somites, which are very distinct, increases to VI, which is three times as long as II, undergoes little diminution in the branchial region, but increases somewhat in the region posterior to the principal branchiæ.

Parapodia similar in form and variations to *E. mucronata*, but the neuropodium rather larger and the whole more prominent. The notopodial cirri are remarkable for the very large size of the basal portion, which much exceeds the entire neuropodium in size in the middle region of the body. Notopodial cirri relatively short, about twice the length of the neuropodium to which they are attached, scarcely reaching half-way to the dorsimeson, tapering, faintly articulated at least anteriorly, the basal sense-organ very small; a conspicuous bilobed brown spot occurs just within the body at the base of the dorsal cirrus.

Branchiæ appear suddenly as two filaments on the left side of IX and 3 on the right side of X, increasing to 4 on XI, 5 on XVIII and XIX, which number is maintained to XXXV and XXXVII, with an occasional variation to 4, especially on the right side, then 4 and 3 to XLI, and 2 for the remainder of the piece. Even when best developed the branchiæ of the two sides are separated by fully half the width of the back. Their aspect is very different from the branchiæ of *E. mucronata*; the stem arises in the same way and curves mediad over the back, but it is angulated, and the branches, instead of arising erect, dicotomose nearly regularly with it and curve parallel to it toward the median line.

The number of setæ is moderate, the compound and capillary being about equal and rather definitely arranged in rows. Compound setæ very pale yellow, rather stout, the terminal portion of the shaft thickened for a distance of 5-6 times the ordinary diameter, with axial striations and marginal denticulations for a long distance; appendage relatively short, less than the enlarged end of shaft, the tip strongly hooked and prominently bifid; the guard broad, extending a short distance beyond tip of appendage, striated and marginally denticulated.

Capillary setæ colorless, gently curved like an italic *f*, slightly enlarged about middle with a narrow denticulated wing, and tapering to a fine point in the terminal $\frac{1}{3}$. Paddle-shaped pectinate setæ wider than in other species of *Eunice* herein described, with about eleven

teeth, the marginal ones of which are only slightly and subequally prolonged.

Acicula black and opaque; ordinary kind two or occasionally three, tapering rather suddenly to a blunt, curved tip; posterior ventral ones rather strongly sigmoid, the tip hooked, bifid, with a broad, well-marked, striated guard.

All of the jaws, except the anterior lateral, which are brown, have a peculiar hoary appearance. Mandibular carriers slender, about $2\frac{1}{2}$ times as long as the calcareous plates; the latter roughly triangular, the posterior internal angle broadly rounded, the most acute angle anterior and somewhat divergent; medial side shortest, convex, with a small process which joins its mate; anterior margin concave and posterior convex; 2 anterior teeth besides the angle.

Maxillæ slender, the carrier small and without a constriction. Posterior lateral plate triangular, with a transverse joint about the middle, with 5 teeth and a posterior compressed margin on the left, 6 teeth and a longer toothless margin on the right. Anterior group of 2 right and 3 left jaws; the dorsalmost rather large, divided into 2 in each case and bearing a single rather broad tooth; the second long on the right, with 11 fine teeth, shorter on the left, with only 5; unpaired left jaw with 8 teeth.

Sagami Bay, 3,698, 153 fms.

Eunice mucronata sp. nov. (Pl. XXV, figs. 42-45.)

Size small, the largest entire worm having a length of 110 mm. exclusive of the cephalic and caudal appendages, but other incomplete specimens indicate a length up to 150 mm., and have a width at the end of the anterior fourth of 4 mm. Form moderately slender; number of segments about 125.

Prostomium slightly broader than long, the length about equal to the peristomium; deeply bilobed anteriorly, the frontal tentacles prominent and widely divergent below, the median sulcus deep and wide, extending from a point between the external paired tentacles on the dorsum nearly into the mouth ventrally and posteriorly, palpal styles very short, scarcely elevated above the basal lobes from which they are delimited by a shallow encircling groove. Eyes 1 pair, large, purple, on posterior margin of head, just ventrad of inner paired tentacles, and in the preserved material partly concealed by the anterior border of the peristomium. Tentacles all long, slender, tapering, and not, or, only very faintly, articulated, the median reaching to XIII, the inner lateral to XI, and the outer lateral, which are sometimes more distinctly articulated than the others, to IV or V; all are very fragile

and consequently often injured and imperfect; inner laterals arise just dorsad of the eyes, outer laterals just cephalad.

Peristomium about as long as the prostomium laterally, but elsewhere shorter; dorsally it presents a shallow bay affording an inset for the bases of the median and inner lateral tentacles, laterally a subocular lobe which is united with the prostomium and partly conceals the eyes, and ventrally a pair of lobes which conceal the mandibles and are separated from one another and from the lateral lobes by emarginations. Tentacular cirri long and slender, reaching slightly beyond the anterior extremity of the palpal lobes and, when reflexed, caudad to somite VII.

The second somite is about $\frac{1}{3}$ the lateral length of the peristomium, and $\frac{3}{4}$ the length of somite V, to which the lengths of the somites increase, beyond which they decrease through the branchial region, and then regain their maximum size, which is retained until they finally fall off to the caudal end. The body as a whole is somewhat depressed, most so in the branchial region, strongly convex dorsally in the prebranchial and caudal regions, but ventrally flattened throughout, with a strongly marked neural groove. The two long tapering caudal cirri equal the last 9 segments in length.

The first pair of parapodia are on a level with the ventral surface, and succeeding ones gradually rise until the normal position about midway between the dorsum and venter is attained by X or XI, and maintained throughout the branchial region and beyond; then they sink again to the ventral level posteriorly. The typical structure is reached at about the 5th or 6th parapodium. Neuropodium short, little tapered, truncate and somewhat bilobed. Neuropodial cirri with enlarged, tumid bases about equal to the neuropodia, bearing small lobe-like terminal pieces about $\frac{1}{3}$ as long. Notopodial cirri slender, with a slight sensory swelling on the ventral side near the base, about 3-4 times the length of the neuropodium and nearly long enough to reach the median line of the back. The first parapodium consists of a minute setigerous lobe, a long notopodial cirrus reaching the anterior border of the peristomium, and a much stouter basally swollen neuropodial cirrus of about half this length. Toward the posterior end the parapodia become more tapering in continuation of the body outlines, and scarcely project from the surface; the neuropodial cirri lose the basal enlargement, taper regularly, become more prominent and assume a more caudal position with relation to the foot; the notopodial cirri become relatively shorter, the extreme posterior ones being about twice as long and half as thick as the ventral, and the sensory elevation more prominent.

Branchiæ appear and cease abruptly, occupying somites V to XXXVI, caudad of which they do not ordinarily occur. Each arises in common with a notopodial cirrus from a very short base; and the main stem curves gently over the back to meet its fellow of the opposite side at the middle line; the stem tapers and the erect pinnæ arise from it separated by intervals of $\frac{1}{2}$ their diameter; they are of unequal length, the middle ones about equalling the notopodial cirrus, and the end of the stem bends upward as the last branch. At both ends of the branchial region the number of pinnæ is subject to considerable variation, the following figures being the average of 3 specimens upon which all were counted. They appear as a small process on V which elongates on VI, become trifid on VIII, and have 4-6 branches on IX, 7-9 on X, 12 by XIV, 14 at XVIII or XIX, which number is retained, occasionally rising to 15, to about XXX or XXXII, and then falls rapidly to 10, 7, 5 and none on successive somites.

Typical parapodia bear setæ of three kinds, all slender, delicate, and colorless. First, compound setæ: numerous, in a fasciculus on the ventral part of the neuropodium; stems curved, with a short abruptly enlarged end striated axially and serrated on one margin; appendage slender, elongated (most so anteriorly), with the end weakly hooked and faintly bidentate, the margin finely serrated, the guard greatly prolonged in a mucronate tip equal to $\frac{1}{2}$ or more the length of the appendage. Second, very slender elongated capillary setæ arranged in a row which extends around the dorsal and posterior sides of the fascicle of compound setæ; these taper gently and uniformly, and appear to be nearly or quite smooth. Third, paddle-shaped pectinate setæ in a small fascicle just dorsad of the acicula, very delicate and terminated by 9 or 10 points, of which the 2 marginal ones are somewhat unequally prolonged; these are very inconspicuous, being concealed by the bases of the capillary setæ, and the flattened ends are placed horizontally.

The ordinary acicula are pale yellow, 2 in number, 1 much stouter, simple, tapering, with blunt slightly bent tips.

Beginning with the mid-branchial region and continuing caudad 1 or 2 additional sigmoid uncinatæ acicula with guarded, hooked, trifid tips appear on the ventral margin of the neuropodium.

All jaws pale brown except the white calcareous mandibular plates. Mandibular carriers broad anteriorly, but tapering rapidly to very slender divergent posterior ends, about twice the length of the calcareous plates; the latter somewhat triangular, the angles anterior, postero-medial and postero-lateral; inclined to the carrier at an angle of about 45°, but the anterior angle bent forward so as to lie in a longitudinal

plane; besides the anterior angle a single obscure tooth about the middle of the antero-medial side. Maxillæ of the usual form, the carrier minute, the 2 halves together scarcely exceeding in width the base of the maxillæ proper, and their length only $\frac{1}{4}$ that of the latter. Posterior lateral plate triangular with unusually long median side bearing about 10 conspicuous sharp teeth. Two anterior right, 3 left jaws; the 1st with a single tooth, the 2d with 11 right and 8 left, the 3d left with 8 teeth occupying its entire margin.

Very common in Sagami Bay, 3,698, 153 fms

Eunice gracilis sp. nov. (Pl. XXV, figs. 46, 47, 48.)

A rather slender-bodied species with parapodia of greater length than usual. The type consists of 110 somites, is 49 mm. long and 4 mm. wide to the tips of the feet.

Prostomium about equal in length to peristomium, into which it is less retracted than usual, anterior sulcus not quite reaching to median tentacle on dorsal surface, but passing into mouth ventrally. Frontal tentacle prominent, divergent, terminal pieces rather larger than usual. Tentacles articulated, the constrictions becoming fainter toward the base; median reaches to VIII, inner laterals to VI, outer laterals imperfect. Eyes wholly exposed, large, purplish-brown, in the usual position.

Peristomium rather short, longest laterally where it about equals prostomium, mandibular lobe not bidentate, short, oral margin very faintly furrowed and crenulate, dorsal free fold or collar short, barely reaching the median tentacle, and leaving eyes fully exposed. Second somite rather obscurely separated from prostomium, of which it is about $\frac{1}{3}$ the length. Dorsal cirri articulated, reaching to centre of eyes anteriorly and $\frac{1}{3}$ into somite V, posteriorly.

Somite V, the largest in the prebranchial region, is about $1\frac{1}{2}$ times II. In the branchial region all somites are shorter than in the pre- or post-branchial regions. Body very little depressed, and ventral surface unusually convex, with a very faint neural groove. Anus subdorsal, with two very long more dorsal and posterior cirri equalling the 17 posterior somites, and two short more ventral and anterior ones between $\frac{1}{3}$ and $\frac{1}{2}$ the length of the others.

Parapodia of the usual form and modifications, but rather longer than usual, and, owing to the ventral convexity of the body, placed relatively higher on the sides. The branchiæ resemble those of *E. mucronata* in that the branches are erect upon a stem curving parallel to the body walls, but differ strikingly in that the termination of the stem, instead of bending dorsad parallel to the other filaments, as in

that species, diverges sharply at an angle from the last one. The number of filaments developed on successive somites is as follows; 1 on VI, 2 on IX, 3 or 4 on X, 6 on XII, 7 on XIII, 8 on XIV, 9 on XVI or XVII, 10 on XXII, which number continues, with occasional variations to 9 or 11, to XXX; then through 9 and 8 to 7 at XL, 3 or 4 at XLII, 2 on XLV, 1 on XLVI and none from XLVIII caudad.

Compound setæ colorless, numerous, arranged irregularly with the capillary setæ on an area which is nearly circular on anterior and elliptical on posterior somites, and near the dorsal border of which the acicula protrude; terminal thickening of shaft short, but decided, striated, dorsal margin very closely and finely denticulated; appendix very short, especially on the posterior feet, where its length is scarcely more than 3 times its width; tip bifid, the teeth widely separated; guard very narrow, barely reaching beyond end of terminal tooth, its edge finely denticulate.

Capillary setæ colorless, exposed for about $1\frac{1}{2}$ times length of compound setæ, nearly straight, tapering nearly regularly from base to apex, dorsal margin minutely denticulated. Spatulate and pectinate setæ colorless, gently widened toward end, terminated by only 7 or 8 points, one of the marginals being much prolonged and bent at an angle to the plane of the others.

Uncini absent from the anterior parapodia, pale yellow, 2 or 3, passing obliquely through the foot and protruding from the ventral side of its end, 1 usually considerably larger, form sigmoid, somewhat enlarged at middle, terminated by one erect tooth and a larger hooked one, guard broad.

Mandibles with the carriers broad and short, scarcely exceeding the jaw plate in length; the latter large, obliquely elongate ovate, widely divergent, with 3 ridges and teeth besides the prominent but rather blunt terminal ones. Maxillæ stout, strongly hooked, with short, broad, unconstricted carriers. Posterior dorsal jaws triangular, toothed along almost the entire medial margin, the left larger, with eight coarse teeth, the right with 7 diminishing in size caudad. Two anterior dorsal jaws on right, 3 on left side; the first minute with 1 tooth; the next strongly curved, with a very broad thin plate, and 11 or 12 teeth on each side; the asymmetrical left plate with 13 teeth.

Totomi Sea, 3,730, 34 fms.

Eunice medicina sp. nov. (Pl. XXV, figs. 49, 50, 51.)

The type, which is entire, but somewhat contracted, consists of 82 somites and measures 32 mm. in length and 1.5 mm. in greatest breadth. It is probably immature. A second incomplete example is somewhat

larger, having a length of 28 mm. for 54 anterior somites, and a maximum breadth of 2 mm. The posterior parapodia contain spermatozoa.

Prostomium of form usual in the genus, slightly longer than peristomium; ventral furrow not especially deep and lobe not widely divergent; frontal tentacles occupying entire ventral end of lobes and bounded by completely encircling furrows. Eyes 1 pair, brown, near posterior margin of head, directly below and in contact with base of inner lateral tentacles, not at all concealed by cephalic fold of peristomium. Tentacles relatively short, only very faintly articulated, the median lost in both specimens; inner lateral of seven joints and reaching to posterior end of somite VI; outer lateral of 4 or 5 joints and reaching to III. Peristomium distinct, of equal length all around and slightly less than prostomium, with which it is not fused laterally.

Second somite about $\frac{1}{2}$ length of peristomium, distinct, nuchal (tentacular) cirri slender, very faintly articulated and reaching anteriorly to base of inner lateral tentacle, or posteriorly to the middle of IV. As usual the somites in the region of greatest branchial development are shorter and more crowded than either anterior or posterior to this region. The last 8 or 9 somites taper rapidly to the anal ring, which is slightly enlarged. Caudal cirri 2 pairs, the hinder very slender and delicate, equalling 11 last somites, the short one scarcely equal to the width of the anal ring.

Except for their somewhat greater prominence and the peculiarities of the neuropodial cirri, the parapodia have the characters usual in the genus. The tenth parapodium has the neuropodium roughly square in form, with the suprasetal portion more vesicular, tumid and enlarged than usual in small species, the acicular lobe between the dorsal end of the series of compound setæ, and the fascicle of capillary setæ prominent. The very characteristic neuropodial cirrus has an enlarged basin-shaped swollen base, the hollow of which looks ventro-laterad, while the terminal process is a thick, short, rounded process of its dorso-lateral margin, the whole, in certain views, having a striking resemblance to a mortar and pestle. Notopodial cirrus separated by an interval from the neuropodium, double its length, the basal half slightly swollen and receiving into its root the ends of 2 slender curved acicula, the terminal half slender and obscurely articulated.

Toward the anterior end the neuropodium is reduced in size, the depression in the base of the neuropodial cirrus is lost, and the base becomes first spherical and finally cylindrical, the notopodial cirrus approaches the neuropodium, becomes relatively longer, with a more

swollen proximal and more distinctly articulated distal portion. The extreme of these changes is exhibited by the 1st parapodium, in which both cirri are connate with the base of the neuropodium, than which the neuropodial cirrus is twice, and the notopodial cirrus $3\frac{1}{2}$ times as long, the base of the former being cylindrical and twice the length of the terminal piece, while the notopodial cirrus has the proximal end much swollen, and the distal divided into 3 short joints. The second parapodium differs from the first almost solely in the larger size of the neuropodium.

With the gradual reduction in size of the neuropodial cirri toward the posterior end of the branchial region the basin-like form of the ceratophore is gradually lost, and the whole parapodium assumes the form peculiar to the posterior half of the body. The acicular lobe of the neuropodium is so reduced in size that the ends of the acicula project conspicuously beyond it. Still farther caudad the parapodia become more pointed, their outlines nearly continuous with the dorsal and ventral curvatures of the body and the two cirri of approximately equal length. The neuropodial cirri are stouter and more closely united to the neuropodium, the notopodial still retain slightly enlarged bases, but all appearance of articulation has gone.

The branchiæ are pinnate, the stem arising at right angle from the base of the notopodial cirrus and curving parallel with the back toward but not reaching the middle line; the stiff, erect branches arise at regular intervals of about twice their own diameter, are subequal in length, shorter and more slender than the cirrus, and the end of the main stem bends upward as the last pinna.

The following table shows the distribution of the branchiæ and the somites on which occur changes in the number of pinnæ on the right and left sides of both specimens:

No. of Somite.	TYPE. STATION 3,700.		No. of Somite.	COTYPE. STATION 3,707.	
	Left.	Right.		Left.	Right.
V.....	1	1	V.....	1	1
X.....	3	3	IX.....	+	3
XI.....	4	5	X.....	4	4
XIII.....	5	+	XI.....	5	6
XIV.....	+	6	XII.....	6	+
XVI.....	6	+	XIV.....	7	+
XVIII.....	+	5	XVII.....	+	7
XX.....	5	+	XXII.....	+	6
XXIII.....	4	4	XXV.....	6	+
XXVII.....	3	3	XXVII.....	3	3
XXVIII.....	0	2	XXVIII.....	0	0
XXIX.....	+	0			

Compound setæ occur in all parapodia; colorless, the stem curved, its end enlarged very gradually to a maximum of twice the ordinary diameter, the thickened part with oblique axial striations and a finely denticulated convex margin; appendix a relatively slender blade, the greatest width $1\frac{1}{2}$ times the diameter of the stem and its length about $5\frac{1}{2}$ times the width (middle of 10th parapodium), terminal teeth prominent, well separated, moderately hooked, edge of blade finely serrate, guard prolonged beyond body of blade as a sharp spine about equalling in length the width of the blade.

Capillary setæ are also found as a fascicle in the dorso-posterior part of each neuropodium; they project two or three times as far as the compound setæ, are colorless, straight or gently curved, the terminal half very finely acuminate and the surface feebly granulate. Paddle-shaped pectinate setæ appear to be absent from the first parapodium, but occur on all the others in very limited number at the base of the bundle of capillary setæ; the end is curved in half-round form, is relatively narrow, 3 to 4 times the diameter of the stem, with about twelve slender, straight points of even length and one delicate prolonged marginal process.

Both neuropodial and notopodial acicula are present in all of the parapodia; the latter are always 2 in number, very slender, tapering and with rather abruptly curved ends which terminate just opposite the apex of the angle between the notopodial cirrus and its branchia. The ordinary neuropodials are also 2 in number and enter the acicular lobe, beyond which their blunt, straight, or (posteriorly) bent ends project, most prominently posteriorly. The *j*-shaped, hooked acicula are first detected on somite XXI. A single one (rarely 2) passes obliquely through each neuropodium, appearing at the ventro-lateral angle. They are stout, pale yellow, rather strongly curved and hooked, the principal beak-shaped process looking forward and surmounted by an unequally bifid accessory process, the smaller division of which is sometimes minute or even absent; guard wide, slightly bilobed and striate.

The color has been entirely lost except the brown spots at the bases of the notopodial setæ. The cuticle is only slightly iridescent, most so on the head.

Sagami Bay, 3,700, 63 fms., type; Suruga Bay, 3,707, 63-75 fms.

ONUPHIDÆ.

Hyalinœcia tubicola (Müller) Mgrn.

What should perhaps be designated as a distinct variety of this species occurs throughout the entire region of Suruga Bay and Totomi Sea, in from 63 to 167 fathoms. 3,707, 3,715, 3,737, 3,740.

***Northia macrobranchiata* McIntosh.**

This species was dredged by the "Albatross" south of Yedo, Japan, on a bottom of green mud, in 345 fathoms. The species is evidently quite common and widely distributed throughout Sagami and Suruga Bays and the Totomi Sea in depths from 31 fathoms at station 3,703 to 749 fathoms at 3,696. A few specimens occur in the collections from each of the following additional stations, 3,704, 3,707, 3,715, and 3,740. At 3,696 a number of the peculiar tubes of this species were procured. It is surprising to find them covered at a depth of 749 fathoms with bits of wood, pine twigs and needles, leaves, straw, etc. The only entire specimen in the collection comes from station 3,704, and permits the description of the posterior end, hitherto unknown. The branchiæ continue to the 2d preanal somite, on which they still equal the foot in length, are quite thick, and bear the notopodial cirrus as a minute process, of not more than $\frac{1}{4}$ their diameter, on the external side of their base. Anal cirri 2, very delicate and slender, equalling the length of the last 7 somites.

***Northia geophiliformis* sp. nov. (Pl. XXV, figs. 57, 58, 59.)**

Upon a cursory examination this species presents a striking general resemblance to *Geophilus* or other slender Chilopod, a similarity which is enhanced by the regular alternation of reddish-brown and pale bands across the dorsum.

The form is slender, elongated, slightly depressed and linear, but just perceptibly tapering from the anterior fourth posteriorly, the hinder body region becoming at the same time more rounded. None of the numerous specimens is complete, more or less of the caudal end being deficient in each case, but a separate caudal end of 44 somites was found. The type specimen has a length of 5.7 mm. for the anterior 109 somites and a maximum width between the tips of the anterior parapodia of 2 mm.

Prostomium small, narrow, inconspicuous, scarcely more than a common meeting place for its conspicuous appendages, and closely united with the peristomium. No trace of eyes can be detected. Frontal tentacles prominent, rather slender, fully as long as prostomium, ovate-oblong in outline, but circular in section, attached by contiguous constricted bases and strongly divergent. Palpi also prominent, about twice the size of frontal tentacles and projecting almost horizontally outward from sides of dorsum of mouth. Dorsal appendages of prostomium large and conspicuous with remarkably long annulated basal pieces, and, except the outer lateral, long, slender, whip-like styles, which are very fragile and usually detached or injured;

median tentacle distinctly smaller than inner laterals, its tip reaching only to VIII, while the inner laterals reach to XI, its base constantly only $\frac{2}{3}$ that of inner laterals, of 6 narrow rings and terminal $\frac{1}{3}$ not annulated, while that of the inner lateral has 9 rings and a terminal smooth portion; outer laterals in the same transverse line with inner laterals, occupying nearly the position in which eyes are ordinarily present, usually perfect, short, reaching, when reflexed, to IV only, remarkable for the great length of basal piece, which equals, or even exceeds the style, and consists of 11 annulations, decreasing in size and distinctness toward the end; style short, relatively stout, undivided, but sometimes bearing a terminal filament.

The buccal ring is probably compounded of the peristomium and the succeeding somite, the posterior bearing the tentacular cirri and the anterior the so-called palpi with which it is connected; longer than prostomium, ventral and lateral oral lobes prominent. Tentacular cirri slender and rather long, reaching to the tips of the frontal tentacles, bases with 2 or 3 obscure annuli but no distinct segments.

First 4 setigerous somites sharply distinguished from the others by their length, which causes the parapodia to stand widely apart instead of being crowded, as well as by the length and slenderness of the cirri-form processes of the parapodia; first much the longest and anteriorly the widest, the succeeding three becoming successively shorter and the margins rounded, thus gradually approaching the typical form, which is short, wide and depressed, with dorsal and ventral surfaces nearly flat.

Anal segment prominent and somewhat funnelform, with 2 pairs of crowded, long, slender caudal cirri, the more posterior equal to 13, the other to 10 terminal somites.

First 4 parapodia arise at a low level from the anterior ends of their somites; except the first, which is directed slightly forward, they project almost straight laterad. Body of parapodia simple, relatively slender, and about equalling length of somite to which it is attached; bearing 3 long slender tapering cirri, the dorsal longest, the middle, which continues the neuropodium as a postsetal process, next, and the ventral shortest, the latter also attached nearest to base of parapodium; both dorsal and ventral cirri slightly constricted at base, then a little swollen, then regularly tapering and slender. Fifth parapodium more dorsad, the base and neuropodium smaller, ventral cirrus reduced to a short, thick glandular lobe, its postsetal lobe shorter and little cirriform; it bears the first branchia. On succeeding somites the glandular area into which the ventral cirrus becomes converted

crowds the much reduced parapodium dorsad, until by XV it is directed upward and quite invisible from below, but a reverse change sets in by XXX, and, with the final disappearance of the glandular area, the parapodia again become quite lateral in the posterior half of the body. By XV also the postsetal lobe has become a small inconspicuous process, but the dorsal cirri, although somewhat reduced, remain always prominent.

Branchiæ prominent but simple, arising from a common base with the dorsal cirri, and when fully established appearing as the direct continuation of that base, of which the cirrus has more the aspect of a lateral branch; they are erect and long enough to just reach middle line of back when best developed. Sometimes they are foreshadowed by a bifurcation of the dorsal cirrus of the 4th parapodium, but normally appear abruptly on the 5th as a slender filament equalling the cirrus in length, but quickly increase to a considerably greater length, and continue with no change except a slight decrease in size as far at least as the 110th setigerous somite. As the posterior 44 somites show no trace of branchiæ it is evident that this species must reach a length quite remarkable for the genus.

With the exception of the posterior hooked acicula, which are relatively stout and pale yellow, the setæ are delicate and colorless. Compound hooked setæ are confined to the first 3 parapodia in all the specimens examined with reference to this point, and, with the exception of 2 or 3 slender pointed dorsal setæ, are the only kind present in the first parapodium; end piece with 3 processes, the terminal one longest; guard prolonged into an acute tip which reaches far beyond the body of the seta.

Slender, capillary setæ are present in all the parapodia, but in small number in the first 3, while from the 4th to about the 10th they are the only kind occurring, and are somewhat larger, with more evident serrate wings. Parapodia of the middle region each bear a tuft of such setæ projecting from the dorsum of the foot in a strongly dorso-lateral direction above the hooked uncina.

Paddle-shaped setæ are first detected on the 10th parapodium, on which 1 appears, while posteriorly 4 or 5 occur between the capillary setæ and the hooked aciculum. They are very delicate and easily overlooked, with slender, somewhat curved stems and obliquely truncate, slightly curved terminal blades bearing about 16 delicate spines, and marked with as many converging striæ.

In addition to the ordinary acicula, each neuropodium, beginning at about the 10th or 12th, is provided with 2 pale yellow uncina with

longitudinally striated stem and bifid guarded tip, the promimal process being much the larger and the guard broad, closefitting and delicately striated.

Color fairly well preserved; each segment of the anterior region marked with a posterior, broader, reddish-brown band, which spreads over the entire segment laterally, and an anterior whitish or pale yellow one; head generally reddish, with a median anterior dark area; dark pigment cells also in the cephalic appendages and branchiæ; other appendages, ventral surface and entire posterior region unpigmented; cuticle with a brilliant greenish iridescence.

Tube delicate, mucoid, covered with fine silt.

North of Sendai Bay, 3,771, 62 fms. Type and numerous other specimens. Also Sagami Bay, 3,695, 175–191 fms.; 3,698, 153 fms.

PARANORTHIA gen. nov.

Intermediate between *Northia* and *Rhamphobrachium*. Two pairs of parapodia are prolonged and carried forward on the ventral side of the head as in *Rhamphobrachium*, but their setæ are coarse acicula as in *Northia*, not capillary as in *Rhamphobrachium*.

Paranorthia brevicornuta sp. nov. (Pl. XXV, figs. 52–56.)

A small species represented by an incomplete specimen of 62 somites, having a length of 22 mm. and a maximum width between the tips of parapodia of 1.25 mm.

Prostomium, as seen from above in the slightly bent up attitude of the specimen, nearly circular, but slightly and broadly emarginate behind, frontal surface smooth, regularly rounded. Eyes absent. Tentacles all in anterior half of prostomium, the paired in advance of the median, and the outer lateral well down on sides below level of frontal tentacles; basal pieces of median tentacles shorter than those of lateral, which are as long as $\frac{1}{2}$ width of head; terminal pieces of median and inner lateral subequal, subulate, their length about $1\frac{1}{2}$ width of head; outer lateral shorter, equalling width of head, stouter and blunt. Frontal tentacles globoid, their constricted bases in contact on anterior margin of head. Palpi bean-shaped, length equal to style of outer lateral tentacle. Peristomium distinct, about $\frac{1}{2}$ length of prostomium on the dorsum, longer ventrally, where, as well as laterally, it is crowded forward by the following somites and, with the prostomium, is bent somewhat dorsad. Tentacular cirri small, awl-shaped, about equalling peristomium in length.

The first two pairs of parapodia are enlarged and bent forward beneath the head as in *Rhamphobrachium*, but they are less produced, and the third pair is not similarly modified as in that genus. The first

reaches the level of the anterior margin of the head, and the second as far as the base of the median tentacle, the total length of the second being somewhat greater. Each is subcylindrical, about 3 times as long as thick, truncate, with short presetal and postsetal lobes, the latter somewhat longer and deeper, and a small papilla-like lobe on the ventro-distal angle. Dorsal cirri arise from the middle of the dorsal surface by a slightly constricted base and then bend outward and extend stiffly nearly parallel to the neuropodium or even approach it and reach somewhat beyond its tip. Ventral cirri also arise by a constricted pigmented base, beyond which they have the form of a spruce cone and extend toward the middle ventral line, which they nearly reach owing to the approximation of the parapodia; the first arises nearly opposite to the dorsal cirrus, the second near the base of the foot.

The third and all succeeding parapodia are lateral in position and gradually attain a higher plane; they are smaller and project straight outward. On the third the neuropodial cirrus is much shorter, broad oval in outline, and on succeeding parapodia becomes a mere opaque rounded lobe, which gradually becomes less and less prominent and disappears at about XXX.

The tenth foot is typical. It consists of a short truncate neuropodium with a small presetal lobe, a tapering bent notopodial cirrus of about twice its length, and the reduced neuropodial cirrus. The posterior parapodia are further reduced, but, owing to the very poor preservation of this region, cannot be accurately described.

Branchiæ appear on somite X as a single thick filament rising from the dorsal side of the notopodial cirrus; the branchia is double the length of the cirrus in succeeding somites, becoming bifid on XXIII and thence backward rising erect as two equal divisions twice as long as the cirrus. The posterior end is much macerated, but on the last 12 or 15 somites the branchiæ appear to consist of single filaments of undiminished length.

On a very large number of parapodia the setæ are destroyed, but enough remain to permit the description of their general character and distribution. The first two enlarged parapodia each bear 3 large setæ or acicula, but unfortunately the tips of all have been broken off. Succeeding somites exhibit compound, capillary and paddle-shaped setæ, all of which are colorless.

Compound setæ of two forms, the first of which appears to be confined to a group of about half-a-dozen in the ventral part of the third parapodium; they have the end of the shaft rather abruptly enlarged

on both sides for a short distance, margin of socket tipped by a rather long process, proximad to which are a few rather conspicuous teeth; blade relatively short and broad, strongly hooked and bifid at the end with a guard somewhat produced at the apex. In addition to these all of the anterior parapodia, from the third at least to the fifteenth, bear in the middle and ventral part of the neuropodium a number of compound setæ without guards; these are more numerous anteriorly than posteriorly; the shafts have nearly the same form as the guarded setæ, but the blades are straight or only slightly curved, rather broad proximally, but with slender mucronate tips and obliquely striated with one or both margins finely serrate; the blades vary greatly in length, those in the dorsal part of a bundle being more than twice as long as the most ventral ones in the anterior parapodia, while posteriorly only the short ones remain. No compound setæ occur in the most posterior region, but just where they cease cannot be accurately determined.

Capillary setæ are the most numerous and constant, occurring in all parapodia from the third caudad. They differ considerably in length, those dorsad of the aciculum being the longest and the stoutest as well, those ventrad, which replace the compound setæ as they disappear, retain about the length of the latter. Toward the extreme posterior end they appear to diminish both in number and size. All are slender, tapering, very acutely pointed with a narrow smooth-edged wing, at the beginning of which a more or less pronounced bend occurs.

Paddle-shaped setæ are also found in the extreme dorsal part of some of the anterior somites, but their distribution has not been ascertained. They have very slender shafts, wide, suddenly expanded, asymmetrical, curved ends provided with about 20 very fine points of equal length.

All of the acicula are very pale yellow. Besides the projecting acicula or setæ, the first two parapodia exhibit several (perhaps about 10, though the number cannot be certainly determined) long thread-like internal acicula of constant thickness arranged parallel to one another in a regular coil within the foot, those of the first being especially long and forming an additional snarl near the base of its ventral side. Notopodial acicula also appear, those of the first 2 feet being rather strong, straight and stiff and ending in the base of the cirri; in the remaining parapodia they are delicate fibres passing far into the cirri. The ordinary neuropodial acicula are 3 in number, the dorsalmost very stout, all straight and tapering, with the slightly protruding point blunt or slightly enlarged and sometimes a little curved. Guarded aci-

cula have been detected in the ventral part of the neuropodium as far forward as the eleventh foot. Usually two occur, and they are slender, not exceeding the larger compound setæ in diameter, nearly straight, slightly enlarged below the tip, which is bifid and provided with a broad guard.

Suruga Bay, 3,713, 45 fms.

Onuphus cirrobranchiata sp. nov. (Pl. XXV, figs. 60-63.)

A rather small species, the type of which consists of 59 setigerous somites, and measures 42 mm. long, with a width of body at somite X of 2.3 mm., and a maximum distance between the tips of the parapodia at the same place of 5.2 mm.

Prostomium small, about semicircular from above, the length about equalling the peristomium at the sides. Eyes, 1 pair, reddish-brown, circular, entirely exposed; frontal tentacles prominent, rounded, length $\frac{1}{2}$ length of prostomium, strongly divergent, directed forward, downward and outward. Tentacles with short articulated bases, which are little longer than thick and about equal frontal tentacles in size, each of 2-4 rings; styles slightly enlarged at base, long, slender, smooth, entirely non-articulate; median longest, reaching somite XIV, inner lateral XI, and outer lateral IV. Palpi short, thick, prominent, slightly bilobed, strongly divergent from ventral surface of head, and connected with ventral margins of lateral peristomial lobes by a pair of ridges.

Peristomium (which probably consists of two coalesced somites, the first very small and anterior to peristomial cirri) longest laterally, there equalling the prostomium; cirri directly in line with eyes and far forward, slender, tapering, short, scarcely reaching anterior boundary of prostomium, and posteriorly to middle of somite III.

Somite III (next to the peristomium) is nearly equal in length to the prostomium and peristomium combined or to somites IV and V, anterior margin much wider than posterior and projecting considerably beyond any other anterior somite. Remaining somites well defined, and of about equal size until the tapering posterior region is reached. Body rounded, very little depressed, most so in the middle region when distended with eggs, dorsum high and arched, venter flattened. Anus terminal, the anal somite truncate and slightly crenulate; caudal cirri very long and slender, equalling the last 16 or 17 somites.

Enlarged first pair of parapodia very prominent, nearly equalling their somite in length, and projecting strongly forward by the sides of the head, and slightly outward and downward; form simple, postsetal lobe elongated, reaching slightly beyond tip of slender dorsal cirrus

which arises from middle of foot, ventral cirrus shorter, arising from base of foot and ending opposite root of dorsal cirrus.

All other parapodia are much smaller, but the 2d and 3d project slightly forward, and are somewhat transitional in other respects also; dorsal cirri and postsetal lobes increase in length and become slender and tapering, reaching their maximum by XI or XII, when the latter is fully equal to the body of the foot, and the former is 3 times as long and capable of reaching the dorsal mid-line, though habitually carried outward and backward; beyond this region they decrease in length, the postsetal lobe retaining its slender form, but becoming of insignificant size by the middle of the body, while the dorsal cirrus reaches as far as the tips of the setæ. The ventral cirrus diminishes in size rapidly; on the 2d and 3d it remains as a short thick cirrus, by the 4th it is a low dome-shaped opaque whitish lobe below, and distinctly separated from, the foot; posterior to XII it diminishes, and has practically disappeared by XVIII.

The branchiæ are characteristic. They usually begin as a single filament, or occasionally two, on XIII or XIV, arising with the dorsal cirrus from a common base, and dorsad of the latter; this quickly becomes subdivided quite to the base, which shifts its position to the caudal side of the cirrus. The division into 2, 3 and 4 filaments takes place somewhat irregularly, but each filament attains practically its full length immediately; by XVIII or XX the typical number of 5 is reached, and continues, with occasional variations to 6, to about XXXV, when 4 again becomes the predominant number to about XLVIII, beyond which it further diminishes; somites LVI to LVIII bear only small but distinct branchial tubercles, and LIX, the last segment bearing parapodia, has none. Some variation in the number of filaments occurring on somites toward the ends of the series is noticeable. The filaments of which the branchiæ are composed are very delicate and, as their wrinkled condition indicates, very contractile; they are generally about $\frac{2}{3}$ as long as the dorsal cirri, but probably equal or exceed these in life, are deeply cleft and arise in a cluster, though occasionally a more pectinate arrangement is indicated.

Setæ of four kinds, two being coarse uncini. Compound uncini confined to the first 4 parapodia, yellow, stout; appendix curved, bifid, the terminal process large and hooked, the accessory one much smaller, both included in the delicate double truncated guard. This is the only form of seta in the first foot, in which some of them become very large and, in one example, lose the articulation, though this is present in the type specimen; they become successively smaller on the 2d, 3d

and 4th parapodia, in which they lie just ventrad of the other setæ and next to the postsetal lobe.

Beginning with the 5th parapodium, simple uncini replace the compound ones just described, though they are only fully established several somites further caudad, and are usually two in number throughout the anterior branchial region, but may be 3, or even 4, toward the posterior end. They are yellow, stout, nearly straight or slightly bent back (this direction being opposite to the compound uncini), slightly swollen subterminally, the end bifid with two stout, ventrally directed processes, of which the proximal is the larger; guard obliquely fan-shaped and striated; stem rather coarsely striated, which is not the case with the compound uncini.

Slender, pointed setæ occur in all of the parapodia except the first, arranged in typical somites in two horizontal rows above and below the uncini, the dorsal one being larger. These are the only setæ of sufficient length to reach beyond the postsetal lobe, and anteriorly even these do not. Stems much slenderer than the uncini, only the larger ones exhibiting any color, bent dorsad abruptly but slightly at about the middle of the exposed portion; a reverse but more gentle bend in the opposite direction, bringing the terminal part into a direction parallel to the base, occurs in the setæ of the posterior half of the body; flange always on ventral side, widest at angle of seta, disappearing terminally, leaving an acute very brittle point; both stem and flange obliquely striated. On the 4th parapodium the flanged setæ are smaller and fewer; on the 3d and 2d only the dorsal bundle occurs, reduced on the latter to 2 or 3 very small, acute, scarcely winged, colorless setæ. Posteriorly also the winged portion becomes reduced in length.

The 4th kind of seta is the most numerous represented but the least conspicuous of any; a single one appears in the dorsal bundle of the 2d parapodium, but in all succeeding parapodia a close bundle of many occurs between the postsetal process and the dorsal fascicle of flanged setæ. They are of very unequal length, the longest being on the posterior side, but none equal $\frac{1}{2}$ the length of the flanged setæ. They have slender stems terminated by a delicate funnel-shaped enlargement with a crenulated or toothed margin.

Sagami Bay, 3,698, 153 fms.; 3,704, 94 fms.; 3,707, 63-75 fms.; Suruga Bay, 3,738, 167 fms., type.

LUMBRICONEREIDÆ.

Lumbriconereis heteropoda v. Marenz.

This species and *L. bifurcata* McIntosh are very closely allied, if not identical; some of the examples contained in the present collection are so nearly intermediate between the two that difficulty was found in referring them. As a whole the series is most closely connected with *L. heteropoda*, which is also the prior name. It is the most abundant and widely distributed species contained in the collections, occurring at all localities on the coast of Japan at which dredging was done, though in many cases represented by fragments only, and at depths from 36 to 190 fathoms. It was taken at the following stations: 3,695, 3,698, 3,703, 3,707, 3,714, 3,724, 3,735, 3,738, 3,739, 3,740 and 3,755.

Lumbriconereis japonica v. Marenz.

Sagami Bay, 3,698, 153 fms.; Suruga Bay, 3,717, 100 fms.; 3,718, 65 fms.; 3,736, 480 fms.

Laranda robusta sp. nov. (Pl. XXVI, figs. 64, 65.)

This is evidently a species of large size. The incomplete type specimen has a width of 6.5 mm., and a length of 165 mm. for the head and anterior 202 somites, and a smaller example of less than $\frac{1}{2}$ the diameter of the type, consisting of upward of 400 somites, of which the posterior 100 or so have been recently regenerated, measures 210 mm.

The prostomium has a peculiar flattened form, curved and hollowed below like the bowl of a spoon; the outline from above has the form of a haycock with a broad base; in the larger specimens its length is less than the first 3 somites, in the smaller one considerably greater; in both it has a distinct dorsal longitudinal sulcus, and is slightly dovetailed into the peristomium. No eyes visible.

The peristomium and the next segment are nearly identical in form, the former differing only in its relation to the mouth and prostomium, and in the more strongly marked postoral grooves; both are very distinctly marked, and are shorter than the first setigerous somite.

The body is nearly circular in section throughout, the dorsum slightly more convex than the venter, with the parapodia somewhat below the middle lateral line, especially toward the posterior end. The diameter is remarkably uniform, with a slight increase toward the middle, and a sudden diminution in the last 7 or 8 mm. of the small specimen. All of the segments are very distinctly marked and of equal length for at least $\frac{2}{3}$ of the length. No anal cirri are present.

The parapodia are uniform in character throughout; in the middle of the body, where they reach the largest size they about equal the

length of the somite, are stout, not tapered, obliquely truncate, and bear a single blunt, conical postsetal process which arises from the ventro-lateral angle and is directed outward and slightly caudad; a low welt passes around its base anteriorly.

The setæ are arranged in each foot in a simple curved rank between the postsetal process and the presetal welt. In the anterior parapodia only slender setæ occur, and are arranged in two somewhat divergent groups, of which the ventral includes 4 or 5, the dorsal 8-12. All are pale brown, long, slender, simple, sharp-pointed and wingless, with a gentle sigmoid curve. After about the first 20 somites the setæ of the dorsal bundle become stouter and of a deeper color. More posteriorly, in the type at XXVI on one side, XXVII on the other, a single stout aciculum appears with its end projecting at the ventral end of the series. It has much the form of a blunt pointed lead pencil and is of a deep brown color.

The color is an iridescent purplish-brown with dark brown spots above the bases of the parapodia, which tend to spread toward the median line as incomplete narrow zones on each somite.

Type, Suruga Bay, 3,709, 173 to 260 fms.; also Suruga Bay, 3,737, 3,738, 3,739, 65 to 167 fms.

Notocirrus zonata sp. nov. (Pl. XXVI, figs. 66, 67.)

A piece of the posterior end consisting of upward of 120 somites, and representing probably nearly $\frac{1}{2}$ of the animal. It measures 65 mm. long and 3 mm. wide including the parapodia, but not the setæ. The body is nearly circular and tapers toward the anus, which is guarded by a pair of short broad lateral lobes representing a pair of cirri or perhaps two pairs coalesced.

The parapodia are described from the most anterior somite present; they are situated about twice as far from the dorsal as from the ventral middle line, are rather small and slender, with a prominent posterior ventral process, which is somewhat longer than the rest of the foot, and is directed caudad and laterad. Dorsal papilla small but prominent.

Setæ 5, 2 in dorsal, 3 in ventral bundle, colorless or nearly so, with delicate, tapering and winged tips, and sigmoid with the ends directed dorsad; those of the ventral bundle shorter and only slightly bent; of the dorsal geniculate, the ventralmost, sometimes both of this bundle, strongly serrated at the winged knee.

The color is very striking; the ground, including the parapodia, is pale yellow, the middle of each somite completely encircled by a rich orange-brown zone.

Type only, Totomi Sea, 3,729, 34 fms.

Ninoë palmata sp. nov. (Pl. XXVI, figs. 68-71.)

Represented by 98 anterior somites, having a length of 34 mm. and a width of 2.5 mm. at somite XX.

Prostomium of the form of a depressed convex cone with a rather acute apex, length $1\frac{1}{4}$ times the base and about thrice length of peristomium, dovetailed $\frac{1}{3}$ into peristomium on dorsal side, delicate lateral grooves from palpi to apex. No eyes visible. Palpi large, free lobes at sides of mouth and dorsad of it. Peristomium longest at sides of head, to which and to the succeeding somite it is partly united laterally; ventrally produced into 3 lobes bounding the mouth laterally and posteriorly.

Somite II distinct, except where united with the peristomium ventrolaterally, length about $\frac{2}{3}$ peristomium; it bears no parapodium. Succeeding somites very distinct, outlines rounded and regular and of nearly equal length throughout. Body exactly circular, although the presence of the branchiæ give to it a somewhat depressed aspect.

Parapodia appear on II, short, about equal to length of somites from which they arise, the branchiate ones somewhat exceeding this, prominent, sloping slightly forward, outline nearly straight to the broadly rounded or truncate end, which is divided into presetal and postsetal lobes, the former somewhat the longer, the latter bearing the gills.

The branchiæ are processes of the postsetal lobe, which even as far forward as V has developed a longer cirrus-like dorsal piece and a shorter and thicker ventral piece. On succeeding somites the former diverges more and more dorsad, and from the dorsal side of the ventral division successive short thick filaments arise, there being 2 branches on V, 3 on VII, 4 on IX, which number continues, with occasional variations to 5, to XXVI or XXVII. When best developed the branchial filaments spread ventrad well below the setæ; the dorsalmost cirrus-like one is about twice the length of the others and curves over the back; the next one or two are separated but the lowermost 2 or 3 remain connected and diverge like fingers in a palmate manner. All are much wrinkled and evidently contractile. The dorsalmost filament disappears suddenly at about XXX, and the others gradually undergo reduction until finally only a minute papilla on the postsetal lobe remains.

Setæ of two types, both simple; bent lance-shaped ones and hooked, guarded ones which exhibit two modifications toward the two ends of the body. The lance-shaped setæ are pale yellow, colorless at the tip, and occur in two groups in anterior somites, the number being reduced more posteriorly by the gradual replacement of the middle ones by

hooked setæ; they are most numerous in the dorsal group (5-6 dorsal and 2-3 ventral in the middle branchial region) and here persist the longest; the knife-edge flange delicately striated, widest at base, diminishing toward tip, and leaving a very acute point, flange directed dorsally in the ventral setæ, ventral in the dorsal; shaft of setæ bent more or less strongly at the base of the flange and on the margins of the bundle, the tips often recurved in the opposite direction. Posteriorly the lance setæ become reduced to 2 or 3 in the dorsal bundle; darker, even black, in color, straighter, more slender and with a much reduced flange.

The hooked setæ of the anterior segments exhibit transitional characters between the lance-shaped setæ and the posterior hooked ones. Anteriorly they are pale yellow, posteriorly darker as they pass into the more typical hooks, stouter than adjacent lance-shaped setæ, but of the same form until near the tip, when the shaft suddenly contracts, bends slightly backward and terminates in a short truncate hook, bearing about five short teeth of diminishing size; at the same place the flange forms a guard which includes the hook and conforms to its shape. Posteriorly the hooks become darker, longer, the tip stouter and more prominently hooked, the number of teeth 7 or 8, of which the most proximal is the largest, the blade absent except where it forms the hood-like guard, and the stem club-shaped.

Skin strongly iridescent, but color all gone.

Only the type known from station 3,767, Sendai Bay, 14-18 fms.

GONIADIDÆ.

Goniada (Leonnatus) foliacea sp. nov. (Pl. XXVI, figs. 75, 76.)

The largest specimen measures 98 mm. long, 4 mm. between the tips of the setæ in the anterior region, and 5.3 mm. at the beginning of the posterior region. The relatively stout body consists of 160 somites, in addition to perhaps 3 or 4 which have been lost at the caudal end. The posterior region, beginning at somite LXIII, is filled with sexual products in the larger individuals and, being very readily detached, may separate and swim independently at maturity.

Head prominent but shorter than in most species, bluntly conical, slightly depressed, length twice width, composed of only four strongly marked rings, the basal one nearly equalling all the others in length, and the latter decreasing to the tip, furrows on ventral and dorsal surfaces alternating in position and joined by a pair of lateral zigzag grooves which terminate caudally in a small slit-like pit on each side of the peristomium, dorsal to the palpi. On the ventral surface of the

head is an elongated, narrow, triangular, depressed, translucent area reaching from the apex to the mouth, into which the annular grooves do not extend, thus cutting off on each side lateral portions of the rings, which appear as four pairs of low, thick, slightly projecting lobes to which the depressed form of the head is chiefly due. The 4 apical tentacles are present in but one example, and even in this are imperfect through maceration. Palpi (lateral lips), a pair of prominent rounded lobes, with largely free, thin, anterior margins at the sides of the mouth. Peristomium indistinctly separated from the base of the prostomium and the first foot-bearing somite; ventrally it forms a prominent median lip. In two of the small examples from Sta. 3,771 and one larger from Sta. 3,695, a minute cirrus is present just in line with the parapodia on the buccal ring, but cannot be detected in the type specimen, which is the largest examined. It is possible that the buccal ring may consist of two somites in this genus.

Except the first, all foot-bearing somites are distinct, and in the anterior region about 3 to $3\frac{1}{2}$ times as wide as long, increasing in size to about XLV, then remaining without material change to LXIII, between which and LXII a weakening of the body walls occurs, caudad of which the width rapidly decreases for 4 or 5 somites, beyond which the body assumes a linear form, though the much increased length of the parapodia results in a greater total width and a more depressed aspect than anteriorly. About 100 somites constitute the posterior region; the type has 97, but 3 or 4 caudal somites are wanting. Some smaller specimens with the anal ring present lack caudal cirri, which have doubtless been lost.

As typical of the anterior region the parapodium of somite XV may be described. This consists of a rather stout neuropodium having a length equal to $\frac{1}{2}$ the width of the somite, and divided into a broad, foliaceous, ovate pyriform presetal lobe, the tip of which is divided by a deep cleft into two narrow tongue-like halves, and a somewhat slender lanceolate postsetal lobe, placed just opposite to the cleft in the presetal lobe, which it slightly exceeds in length. Ventral cirrus arises from basal half of neuropodium, rather thick and stout; its tip falls a little short of the setigerous lobes. Dorsal cirrus consists of a rather stout rounded stalk, with swollen base and somewhat flattened, foliaceous, nearly orbicular or broadly ovate-lanceolate appendage, which bends abruptly dorsad.

Toward the head the postsetal lobe becomes shorter than the presetal, and is absent in the first 3 parapodia; the presetal also becomes narrower, and finally loses the terminal bifurcation; the cirri approach

more closely and crowd the neuropodium, the foliaceous character of the dorsal cirrus disappearing. The first parapodium consists of a neuropodium without setæ, but bearing a long, slender, cirrus-like pre-setal lobe, and dorsal and ventral cirri, which differ from the typical ones only in their smaller size. Posteriorly, beginning at about somite XXXV, a small conical notopodium appears just ventrad and cephalad of the dorsal cirrus. This bears setæ at once, and, in relation thereto, is divided into narrow pre-setal and post-setal lobes, of which the latter is more ventrad, features which become more evident as the notopodium increases in size toward the end of the anterior region.

The first few parapodia of the posterior region are transitional in form, but quickly become more foliaceous and assume the characteristic structure which is typically developed on somite LXXV. Here neuropodium and notopodium are well separated by a wide interval, and each bears its appropriate cirrus. The former is essentially as in the anterior parapodia, but both lobes are much broader and more leaf-like, the 2 divisions of the pre-setal more divergent, the dorsal considerably the larger and both longer than the post-setal lobe; ventral cirrus relatively shorter. Notopodium about one-half length of neuropodium, obtusely rounded, broadly attached, and not constricted at base; pre-setal and post-setal lobes not prominent, the latter more ventral, so that an oblique terminal notch appears in face views of the parapodium. Dorsal cirrus rises from the base of the notopodium, and is directed almost vertically dorsad; form similar to anterior cirri, but stalk shorter. More anteriorly each lobe of the notopodium bears a slender terminal papilla, that of the pre-setal being quite long and slender. Toward the posterior end the two divisions of the foot become still more widely separated, and both again more slender and less foliaceous, while the dorsal pre-setal lobe of the neuropodium becomes more prominent.

The neuropodial setæ are arranged in a single vertical fan-shaped row, which spreads very widely in the foliaceous swimming feet of the posterior or genital region, the number of setæ corresponding closely with the width of the lobe. All are of the same form, compound, with very long stems, especially on the swimming feet, and slender, finely pointed, and very delicately fringed blades, which are longest in the middle of each bundle and diminish dorsally and ventrally. The figure does not show the full side view of the blade.

Notopodial setæ similarly arranged in a fan-shaped vertical series of correspondingly smaller spread; all simple, colorless, slightly bent and curved, and tapering to an extremely acute point; the surface marked

with fine granules arranged in oblique rows and appearing as somewhat irregular serrations at the edge.

Jaws black or deep brown and opaque, forming a continuous but irregular ring just caudad of a circle of 18 obtuse lobes which lie at extreme the end of the fully protruded proboscis, and when retracted cover the jaws in somite XXIII. One principal jaw on each side and dorsad, the left one bearing two long hooked spines shaped like the venom fangs of serpents; the right one bearing in addition 2 or 3 smaller but similar spines on the medial side. In the dorsal interval between the principal jaws are 14 or 15 smaller accessory ones arranged in an irregular transverse band; they are of inconstant form but each bears a pair of, or even 3, hooked teeth on a rather stout base. The ventral distance between the principal jaws is more than twice the dorsal, and is occupied by a fairly even and continuous row of 28 to 30 small jaws of various sizes and forms, some being quite rudimentary. As a rule each bears a single claw-like hook directed, as are the others, caudad on an irregular orbicular base having a pair of anteriorly directed, divergent processes. No longitudinal series of accessory jaws is present.

A low muscular fold runs along the mid-dorsal line of the pharynx from its cephalic attachment to the predental lobes, but does not involve a complete folding of the pharyngeal walls as in *Goniada distorta*. The proboscis papillæ are all of one kind, elevated mammiliform, the enlarged somewhat pyramidal bases much crowded in the retracted organ and the teat-like summits pointed and slightly curved. They measure .014 mm. in height, and .009 mm. in diameter of base.

Color a general gamboge yellow, lighter in the furrows and on the contiguous surfaces of parapodia and in the head region, and modified posteriorly by the presence of the eggs, which crowd the sides of the somites and the parapodia. The anterior region, exclusive of the head and a few somites, is very dark and opaque from the presence of an abundant purplish-brown pigment deposited in a narrow zone around each somite, which broadens above and below each parapodium, and affects the terminal parts of the cirri and, to a less degree, the setigerous lobes. The anterior end is iridescent with greenish and bluish reflections. A curiously constant feature is a ventral series of minute but conspicuous black spots, situated in the median line of each intersegmental furrow of the posterior region, at the beginning of which they appear abruptly.

Sagami Bay, 3,695, 190 fms., type and one other specimen; North of Sendai Bay, 3,771, 62 fms., 4 specimens of smaller size.

Goniada distorta sp. nov.

This species is described from a single incomplete specimen consisting of 106 somites and having a length of 66 mm., and in the anterior region a width of body of 2 mm. and between the tips of the parapodia 2.8 mm., while posteriorly the same measurements are respectively 1.3 mm. and 3.7 mm.

Body slender and nearly round throughout, increasing in diameter to somite LX, then diminishing and becoming linear posteriorly; rather wider dorsally than ventrally and somewhat tumid above the bases of the parapodia; posteriorly the great length of the parapodia gives an appearance of depression.

Head of the usual tapering, elongated form, consisting, besides the basal piece, which constitutes nearly $\frac{1}{3}$ of its length, of 7 distinct annulations, diminishing in size and terminated by an 8th slightly wider one. The prostomium is circular, not flattened as in *G. foliacea*, and the furrows are continuous all around; there is no lateral groove, but a pit is present on each side at the posterior margin of the head. Only a single imperfect apical tentacle, of clavate form and having a length about equal to the apical ring, is present. Eyes absent. Peristomium not clearly distinguished from the succeeding somites. The partial protrusion of the pharynx greatly alters the appearance of the mouth, but the lateral lobes or palpi, and the lips appear not to differ from *G. foliacea*. The somites are distinct, but show no indication of subdivision into rings.

The parapodia differ in many respects from those of *G. foliacea*. The anterior or uniramal ones are prominent and slender, have a length exceeding $\frac{1}{2}$ the diameter of the body, and stand out abruptly from the middle of their somites. Neuropodium a compressed cylinder about as deep as long, bearing at the end one postsetal and two pre-setal cylindrical cirriform processes, of which the dorsal presetal is slightly the longest. Neuropodial cirrus, which also arises near the end, but on the ventral posterior face of the neuropodium is slightly longer, and at its base nearly twice the diameter of the setal lobes, and has a conical form. Notopodial cirrus separated by a narrow interval from the neuropodium; it is swollen basally and, near the middle of its dorsal surface, is provided with a shallow depression lined with tall columnar cells, beyond which it bends abruptly dorsad at an angle as though deformed, and terminates as a blunt cylindrical or conical piece not at all foliaceous.

The typical foot of the anterior region just described is retained with little change as far forward as the 4th. The 3d parapodium has

only a trace of the dorsal presetal lobe, and the cirri are of larger size than in the typical foot. The 2d bears still larger cirri, united with the neuropodium, and the latter is still further reduced. The first postbuccal somite bears a fully formed trilobate setigerous parapodium like the second on the left side, and only a simple cirrus on the right side.

Toward the posterior end of the anterior region the base of the neuropodium increases, and the terminal lobes, especially the presetal, diminish in length. The neuropodial cirrus at the same time increases until its tip reaches beyond any other part of the foot, while the ventral portion of the neuropodium which bears it becomes partly cut off by distinct anterior and posterior furrows. Meanwhile the notopodial cirrus has become relatively shorter and stouter and its terminal part slightly flattened antero-posteriorly. All of these changes become progressively emphasized. Not till the 54th somite does the notopodium appear as a slender process arising in common with the notopodial cirrus, and reaching as far as the tip of the postsetal lobe, but not to the end of the neuropodial cirrus. After its abrupt appearance the notopodium becomes gradually shorter and more and more closely united with the cirrus. Although from its beginning supported by an aciculum the notopodium at first bears no setæ, and even as far back as the 65th foot only a single one has been detected. Indeed, throughout the entire region notopodial setæ are very few.

No further important change occurs until somite LXXVI, when the body rather rapidly decreases in diameter and assumes the linear character of the posterior region, while the parapodia increase in length to $1\frac{1}{2}$ times the width of the body, a change due in part to the larger size of the neuropodium and notopodium, but still more to their elevation upon a common base. Taking the 100th parapodium as a typical example the following description applies: Base of parapodium nearly as deep as body, swollen with spermatozoa in the example studied, as long or slightly longer than neuropodium, which is again longer as well as deeper than notopodium, each of which divisions is supported by a single rather stout, straight, tapering, yellow aciculum. Neuropodium divided into two rather short (the dorsalmost the longer), pointed, presetal lobes, and a much broader, leaf-like, postsetal lobe, the somewhat shorter tip of which lies opposite the interval between the slightly divergent presetal lobes. Neuropodial cirrus elongated conical, arising from a distinct base about the middle of the ventral surface of the body of the neuropodium, its tip reaching to end of ventral presetal lobe, from which, however, it naturally diverges ventrad.

Notopodium united with its cirrus for about $\frac{3}{4}$ of its length, only their ends free as short, pointed, triangular, nearly symmetrical, divergent lobes; postsetal lobe rudimentary; cirrus still retains sensory depression but of much reduced size.

The setæ are of two kinds. Those of the neuropodia are arranged in a single fan-shaped group, larger in posterior than anterior somites, but always very much inferior in size to those of *G. foliacea*; all are colorless, compound, with very slender tapering delicately fringed terminal pieces, which are 3 or 4 times as long in posterior as in anterior somites. Notopodial setæ are few in number; when most numerous in the posterior region forming a small fan-shaped fascicle; simple, colorless, shorter but stouter than neuropodials, slender, slightly curved, very finely pointed, and with the rather coarse granulations confined to the convex border.

Pharynx very long, the jaws in its retracted state in somite XLII; the longitudinal muscular fold larger than in *G. foliacea*, with a corresponding groove on the coelomic face of the pharynx, and reaching for the entire length of the proboscis; owing to a half turn of the pharynx its posterior end passes spirally around to the ventral side, with the large jaws. Papillæ of two forms; very numerous bluntly conical ones measuring only .003 mm. in height are arranged in close irregularly oblique rows over the greater part of the surface; somewhat larger ones with compressed bifid summits occur more sparingly and are confined to the muscular ridge. Both have the cuticle thickened and have a single sensory pore just behind the apex. Predental lobes 16 or 18, diminishing slightly in size from the dorsal to the ventral side. Jaws black, opaque, forming a complete ring; larger ones somewhat dorsad, symmetrical, each with four claw-like teeth, diminishing in size dorso-mediad. Accessory jaws in a nearly regular ring, but the alternate ones, owing to somewhat smaller size, stand a little anterior to the others; with the exception of a very few unifid and trifid ones, all are bifid, and of similar form, with the two teeth nearly equal and somewhat divergent, the bases irregularly rounded or with a pair of rather short forwardly directed processes; 13 occur between the dorsal interspace, and 18 or 19 ventrally, the latter distance being about twice the former, and the jaws consequently less crowded.

The color is pale yellow, the cirri and other terminal parts of the posterior parapodia with some brownish-yellow pigment; anterior part of body very pale with a pinkish iridescence.

A noteworthy feature is the occurrence in this species, as in *G. foliacea*, of ventral, intersegmental dark spots on the posterior region.

They begin abruptly at somite LXXVII but are less distinct than in that species.

Suruga Bay, 3,739, 35-65 fms.

GLYCERIDÆ.

Glycera gæsi Mgrn.

I am quite unable to distinguish between this species and *G. decipiens* v. Marenz., under which latter name it has already been recorded in Japanese waters from the Bay of Miya. The examples from the "Albatross" dredgings are all of small size. In some the gills are very regularly developed, in others most irregularly and in still others they are altogether retracted. They come chiefly from moderate depths at the more northern stations.

Suruga Bay, 3,715, 65 fms.; 3,723, 13-16 fms.; Sendai Bay and north ward, 3,767, 14-18 fms.; 3,768, 25-27 fms.; 3,771, 61 fms.; 3,775, 57 fms.

Glycera tessellata Grube.

This species is widely distributed in the Atlantic Ocean, but has not been hitherto recorded from Pacific waters.

Sagami Bay, 3,698, 153 fms.

Glycera alba Oersted.

Like *G. gæsi* this species is represented, with one exception, by small examples only and the gills are frequently minute vesicles. The tubercle which appears on the parapodium just above the branchia in Malmgren's, but not in Oersted's, figures is absent in all of these specimens.

Sagami Bay, 3,702, 31-41 fms.; Suruga Bay, 3,707, 63 75 fms.; Suruga Bay, 3,740, 65 fms.; North Japan, 3,767, 14-18 fms.; 3,775, 57 fms., the latter the only large example taken.

Glycera robusta Ehlers.

The anterior end of the single large example by which this species is represented is interesting from the regular occurrence of small colonies of dichotomously branching ciliates between the parapodia. These bear a most striking resemblance to the "gills" of *G. opisthobranchi* v. Marenz.

Suruga Bay, 3,718, 65 fms.

ARICIIDÆ.

Aricia fimbriata sp. nov. (Pl. XXIV, figs. 31-35.)

A specimen comprising the head and 83 setigerous somites, with a length of 60 mm. and a maximum diameter of 7 mm., is the type of

this species. Form as usual in the genus, depressed, flat dorsally, strongly convex ventrally, stout anteriorly, and tapering into a long slender fragile posterior region. This is evidently a species of considerable size, but is represented by 3 short anterior ends and a fragment of the posterior end.

Head mammiform, as viewed from above, with a dome-shaped basal piece incomplete ventrally, being cut into by a low median ridge which is continued to the mouth from the regularly conical pointed terminal piece. Mouth ventral, a rather small slit-like or slightly quadrate opening, bounded posteriorly by the 2d setigerous somite, laterally by the lobe-like thickenings of the 1st setigerous somite, and anteriorly by the caudal end of the prostomial ridge; its four angles are prolonged into chinks passing into the furrows bounding the 1st setigerous somite, which is incomplete ventrally, and between the oral lobes of which the second setigerous somite is produced as a wedge-shaped hinder lip.

Parapodia biramous throughout, the first 16 relatively low, with very broad attachment on lateral faces of somites; both notopodia and neuropodia with broad, more or less pectinate postsetal lobes, the latter much the better developed; posterior to the 18th the parapodia are entirely dorsal, the fimbriated postsetal lobes are replaced by simple ones, and the neuropodium is rudimentary. The 10th parapodium, which is typical of the anterior region, exhibits the following characters: The two rami separated by a narrow cleft; the neuropodium more than twice as broad as the notopodium, strictly lateral, consisting of an extensive, sessile, setæ-bearing area about 4 times as long transversely as longitudinally, an obscure presetal lobe, and a postsetal lobe which is provided at a short interval from the setæ with a high fold bearing about 12-14 conical marginal processes, the dorsalmost of which are somewhat enlarged; notopodium generally similar, the setigerous area raised as a very low compressed ridge, the postsetal lobe narrower but higher, in correspondence with the longer setæ, obliquely and broadly palmate, somewhat like a moose's antlers, and bearing about 8 marginal processes which trend dorsally, toward which side they are larger and the last sometimes bifid. Anteriorly the changes in the parapodia consist in a gradual reduction in size of the entire foot, with a diminution of the neuropodial setigerous areas in vertical extent, and a decrease in number of the postsetal processes, until the neuropodium bears but 3 or 4, and the notopodium usually a larger bifid one. Posteriorly the neuropodial setigerous area suffers in extent by a reduction from the posterior and dorsal borders, the postsetal lobe gradually

shrinks from the ventral margin, from which a few of its papillæ become detached and appear quite isolated on the body walls of the posterior somites of this region and the following transitional region; but such papillæ are few and small, and appear only on the lateral portions of somites XVI to XXI or some of these; the dorsal margin of the notopodial postsetal lobe, with its papillæ, elongates until it appears as a main stem bearing the remaining papillæ on its lateral side.

The 17th and 18th parapodia are transitional but resemble those of the posterior region more closely; they are, however, less dorsal and usually exhibit a few papillæ just ventrad of the parapodia. The 19th is quite typical of the posterior region, directed dorsad from the upper part of the sides of the somite, neuropodium narrow but prominent and erect, with a small leaf-like ovate presetal process having a strong basal constriction, a small conical recurved postsetal process, and, below the constriction, a minute conical neuropodial cirrus, apparently derived from the dorsalmost postsetal papilla; notopodium broader and much more conspicuous, consisting of a setigerous tubercle and a greatly enlarged, pointed, ovate-lanceolate, postsetal process nearly equalling the gill in length, with a constricted somewhat flattened base, and an asymmetrical wing to the blade-like extension of its lateral margin. Changes in the parapodia toward the posterior end consist in slight alterations in proportion of parts; the entire foot becomes more elongated and narrow, the notopodial postsetal lobe even larger and more leaf-like, assuming the form of the branchiæ, except that its base is always constricted, and the neuropodium more reduced in size.

Branchiæ of nearly full size begin abruptly on the 5th setigerous somite and continue as far as the material reaches toward the posterior end; strictly dorsal, separated by $\frac{1}{2}$ the width of the back; anteriorly broadly, then narrowly lingulate, pointed, broadly attached, with a central axis containing 2 blood vessels connected by numerous transverse loops arranged in doubly pinnate fashion; branchiæ of a pair united with each other and with the corresponding notopodia by delicate transverse integumental folds.

Setæ all more or less tapering and acutely pointed. Neuropodials arranged in a dense phalanx, very numerous, rather stout, of two kinds, with transitional forms; those of the anterior ranks shorter, densely fibrillated, olive colored, strongly curved in a more or less sinuous manner, the edge corresponding to the principal convexity distinctly serrated with delicate transverse ridges partly encircling the shaft; those of the posterior ranks much longer, more slender, less strongly

curved, the exposed part lighter in color and spirally canaliculated around a slender fibrous core which usually appears to be somewhat eccentric.

Notopodial setæ in a dense spreading tuft, longer than neuropodials especially toward the dorsal margin of the bundles, but similar in form to the second kind, the spiral canal of smaller calibre, and corresponding to an external spiral raised line, which latter alone persists toward the end.

Setæ of posterior region few in number (only about 6 or 8 in the neuropodium), similar in both rami, very long, slender, straight and stiff, longitudinally striated, the terminal half with a delicate marginal serrature which appears to be due to a series of about $\frac{3}{4}$ collars slightly overlapping, and on one side separated from the shaft by a distinct space, thus foreshadowing the canaliculated form of seta.

A few short delicate setæ with bifid tips, the two divisions of which are fringed on their opposed faces with fine hairs, also occur in the neuropodium.

Anteriorly the neuropodial acicula are inconspicuous, but on the 13th to 16th parapodia inclusive they largely replace the ordinary setæ and become very much enlarged with subterminal thickenings, pointed ends, and a deep brown color; they project as a row of 5-7 short spines, except the dorsalmost one, which in most cases has its entire spindle-shaped terminal half exposed. In the posterior region there are 3 neuropodial and one notopodial acicula, slender, acute, with the tip sculptured for a short distance, exactly as in the setæ.

Suruga Bay, 3,709, 173-260 fms.; 3,724, 20 fms.; North Japan, 3,768, 25 fms.; 3,771, 61 fms.

CIRRATULIDÆ.

Cirratulus gibbosus sp. nov. (Pl. XXVI, fig. 72.)

Form of preserved specimens stout anteriorly, flat below, strongly arched above; slender, pointed, and much depressed posteriorly. The type and largest specimen has 105 somites, is 32 mm. long, and 6.5 mm. wide at XXX, the widest part.

Prostomium a short and broad lip about 3 times as wide as long, with a transverse row of 4 to 6 conspicuous, reddish-brown eyes on each side of a median interval of about $\frac{1}{3}$ the width of the prostomium. Mouth small. Peristomium a prominent, swollen, gibbous ring, as long as the prostomium and elevated above the level, both of this and the succeeding somites. Next follows a neck-like region of 6 very short somites without setæ or branchiæ. The succeeding few somites

widen abruptly and these and all others are uniannulate. Anus minute, slightly dorsal.

The branchiæ begin as a tuft of 3 or 4 small ones on each side of VIII just above the parapodia; on IX a large tuft of upward of 15 arises from a transverse area which extends from the parapodia nearly to the middle line, while each of the succeeding somites back as far as the beginning of the posterior $\frac{1}{3}$ bears a single pair which arises close to the posterior margin about midway between the parapodia and the dorsal mid-line, except anteriorly where the place of origin is lower and more irregular. Posteriorly the size of the branchiæ varies; small and large ones alternate in a very irregular way.

The parapodia consist of small, well-separated neuropodial and notopodial tubercles which begin with the setæ on VIII. For about the first 12 or 13 somites only capillary setæ are present in the notopodial tubercles, beyond that they are mixed with blunt spines, while all of the neuropodial tubercles contain both spines and capillary setæ. The number of both is always small, about 5 capillary in anterior notopodia, usually 2 of each in anterior neuropodia, 1 of each in posterior notopodia, and 1 capillary and 2 spines in posterior neuropodia. Capillary setæ little elongated, but few of them exceeding the distance between the two setigerous tubercles, pale greenish, slightly obliquely striated and fringed on one margin, slender, tapering. Spines simple, slightly sigmoid, greenish yellow, translucent and unstriated; one of the notopodials usually somewhat enlarged.

Sagami Bay, 3,703, 31 fms.

Chaetozone spinosa sp. nov. (Pl. XXVI, figs. 73, 74.)

The type, a complete specimen of 112 somites, is 65 mm. long and 5 mm. in breadth at the end of the anterior $\frac{1}{3}$. The head is very distinctly separated from the body by a deep furrow behind the peristomium, broadly top-shaped as seen from above, bluntly pointed and about as broad as long. Prostomium nipple-shaped, separated from the peristomium by a furrow dorsally and laterally, but on the ventral side reaching back to mouth as a narrow pointed upper lip, behind which is a pair of palp-like lobes bounding the mouth at the sides. Peristomium much enlarged, considerably wider than the next somite and fully twice as long above as below; smooth, regularly rounded, with a faint transverse constriction above and laterally. No eyes and no visible sensory pits. Mouth ventral, with an anchor-shaped anterior extension between the palp-like lobes, bounded posteriorly by a smooth under lip.

Body somewhat depressed anteriorly, more or less quadrate posteri-

only, tapering gradually from end of anterior $\frac{1}{3}$ both ways; both dorsal and ventral surfaces smooth, the former depressed between the dorsal ends of the parapodia, by which it is sharply bounded, and than which it is narrower, the latter wider, not depressed and passing gradually at the sides into the parapodia. Somites rather long, uniannulate, and, with the exception of the first, very distinct and sharply marked by deep furrows; the first united broadly at the sides and by a narrow median dorsal tract to the peristomium, posteriorly rather indistinctly separated from the succeeding somite; it bears an achæitous parapodium; last 7 or 8 somites becoming rapidly smaller and the last 3 apparently achæitous. Pygidium prominent, expanded, somewhat funnel-shaped, and looking obliquely upward; anus in its centre.

Parapodia low but distinct, transverse lateral ridges equal to about $\frac{1}{5}$ of body circumference; anteriorly they are wrinkled and entirely undivided, and pass without distinct boundaries into the ventral surface, but sharply limited dorsally where they rise above the level of the smooth area; farther back the dorsal delimitation becomes less and less distinct and the parapodium becomes somewhat differentiated into dorsal and ventral portions, which assume more divergent and prominent positions on the dorsal and ventral quadrants as the height of the body decreases.

No branchiæ are in *situ*, but a few very long slender and much coiled filaments in the bottle probably belong to this worm, while very distinct scars clearly indicate their disposition. Except about the last 10, each and every somite bears a pair of scars; anteriorly they are very conspicuous, and the first, which is between the dorsal end of the 1st parapodium and the prostomium and probably belongs to the latter, is much larger than the others. For about the next 17 somites the scars are at the extreme posterior margin of the somites and exactly on the level of the dorsal ends of the parapodia, but farther back, as the latter become less distinctly limited, the scars assume a progressively lower and then more anterior position, until in the posterior half of the body they are just behind the lowermost setæ of the dorsal division, or nearly at the middle of the parapodium. The posterior scars become smaller but remain quite evident to the last.

The setæ present a striking contrast to those of *C. abranchiata* owing to the substitution in large part, for the delicate capillary setæ of that species, of stiff, brittle, spinous setæ which stand out in conspicuous whorls at the posterior end. In all parapodia the setæ are arranged in a single vertical rank of two groups, although anteriorly the interval between is so small that from the exterior they appear to be continuous.

The notopodial group is the larger, and both consist of a fan-shaped groups of two kinds of setæ intermixed, except in the last 20 or so somites where only one kind occurs. There are coarse, stiff bristles arranged at regular intervals, 8–10 in the dorsal, 6–8 in the ventral bundles, olive-green, densely striated and granulated internally, except toward the tip, curved, tapering rapidly to the attenuated outer $\frac{1}{3}$, which is colorless and fringed along one margin with overlapping hairs or plates. Very slender hair-like setæ are scattered among the coarse ones, and are 2 or 3 times as long as they, nearly colorless, with internal striæ having a slight spiral turn, continuously tapering, slightly enlarged at base of exposed portion, and provided, except near the base, with very delicate half-round scales which are rather distant, usually alternate on the two sides and toward the tip become reduced to minute cilia-like processes. Posteriorly the coarse setæ become much stouter, lose their delicate tips and form very prominent, slightly curved, blunt-pointed spines, while the capillary ones become smaller, and eventually disappear.

Sagami Bay, 3,698, 153 fms. Type only.

Chaetozone (?) *abbranchiata* (Hansen).

Under the name of *Cirratulus abbranchiatus* Hansen described this species from much smaller specimens in which he found no trace of branchiæ. Otherwise his specimens closely resemble those collected by the "Albatross," which are referred to Hansen's species on the supposition that the types were imperfect. As this opinion may be erroneous a description is added.

Form short and very stout and thick in the contracted specimens, tapering about equally to the two ends which are similarly bluntly pointed; somewhat depressed with dorsal and ventral surfaces about equally convex and the parapodia forming a somewhat thickened marginal ridge. The type has 127 somites and is 38 mm. long by 8 mm. wide. The other specimen is larger.

Prostomium obtusely rounded, somewhat upturned, less than twice as broad as long; no eyes; mouth rather slit-like with lateral lips. Peristomium a simple ring not especially enlarged, resembling the next 2 somites which are much shorter than the prostomium but more than twice the length of the succeeding somites. First 3 somites achæitous but not especially marked off from the succeeding ones, the increase in width being regular, though rapid; remaining somites short and uni-annulate, the last few indistinct. Anus minute, dorsal, above a small tubercle-like pygidium.

Parapodia represented by small, simple neuropodial and notopodial tubercles united by a slight transverse ridge. But very few of the branchiæ remain and the scars are so obscure that the arrangement at the anterior end cannot be determined with certainty; for the greater part of the anterior $\frac{2}{3}$ of the body a pair springs from each somite just above the notopodial tubercles but toward the end of the branchial region the arrangement becomes somewhat irregular, the branchiæ usually occurring at intervals of 2 or 3 somites without change in position.

The notopodial and neuropodial tubercles each bears a tuft of 15–20 very soft elongated slender capillary setæ of a pale greenish color and homogeneous vitreous structure; many of them exhibit an indistinct flattened region of greater or less extent which appears more of the nature of an accidental crushing than a normal structure. These setæ are exceedingly fine and long, very nearly equalling $\frac{1}{2}$ the diameter even of the much contracted body, and appear to the naked eye as conspicuous tufts of very fine whitish hairs. At the posterior end they are somewhat shorter but not enlarged or otherwise different. Compared with the capillary setæ of *C. spinosa* those of this species are less than $\frac{2}{3}$ the diameter and fully $\frac{1}{2}$ longer, much softer and under an equal magnification lack altogether the surface markings of that species.

Suruga Bay, 3,726, 26 fms.; Sendai Bay, 3,767, 14–18 fms.

TEREBELLIDÆ.

Amphitrite bifurecata sp. nov. (Pl. XXVI, fig. 78.)

The type is 70 mm. long and 7.8 mm. in maximum diameter, and consists of 59 somites.

Prostomium a long prominent somewhat horse-shoe-shaped lip without complicating folds, but slightly rolled up and bent back against the bases of the tentacles, behind which there is a low transverse ridge. No eyes. Tentacles long, longitudinally grooved, in a continuous row of about 22.

Peristomium a short simple ring, with a slightly free ventral margin which covers the special lower lip, and no dorsal papillæ or complicating structures. Mouth large, with a wide lower lip besides the peristomium.

The body, as usual in this genus, is somewhat enlarged anteriorly, more slender posteriorly, and throughout its length strongly arched above and flat or concave below. Segments not very distinctly indicated and, except for a few biannulate anterior ones, only obscurely annulated. Somites II, III, and IV with their anterior margins more

or less freely produced at the sides and the latter 2 partly coalesced ventrally; no dorsal papillæ. Ventral plates 10, on somites V to XIV, the first 9 narrow parallelograms, the last broadly elliptical and somewhat separated from the others. Anus large, terminal, its margin faintly wrinkled.

Branchiæ 3 pairs, on II, III, and IV, much branched, the number of divisions about equal on all, but somewhat shorter posteriorly. They have very nearly the form of the branchiæ of *A. johnstoni* Mgrn., and consist of a more or less bent and twisted main stem from which the filaments arise at intervals and divide dichotomously once, twice, or, rarely, even 3 times, or a few remain simple; the basal branches are long and slender, but the length gradually decreases until the apical ones are very short.

On the thoracic segments the parapodia are represented by rather broad ridges, the setigerous tubercle being merely a more prominent projection at its dorsal end slightly caudad of the line of the uncini. The second uncigerous torus is the longest, but the decrease in size is very slight to the last thoracic segment and is accompanied by a slight ventral shifting. The abdominal parapodia are rather large, fleshy and strongly bent, and bear a striking resemblance to the so-called false feet of a lepidopterous caterpillar, but posteriorly become more slender and sloping, and finally diminished in size; all are situated on the ventro-lateral angles of the body.

Capillary setæ occur on IV to XX inclusive, uncini from V to the pre-anal somite inclusive. The former have a narrow blade, nowhere exceeding $\frac{1}{2}$ the diameter of the shaft, the blade fringed for about $\frac{1}{2}$ its length, and a delicate smooth tip. The uncini are arranged in interlocking double rows of about 170 (XX) on the thoracic somites from XI to XX; on all others in a simple series directed forward; on each parapodium of somite XXX there are 80. Their bases are short with the internal margin strongly convex, the anterior end rounded, the posterior pointed, and a prominent subrostral process; the rostrum long, very acute, and strongly hooked, the sinus narrow, vertex much elevated with a prominent crest of at least five transverse rows of spines, of which the first contains 5 or 6 large ones and the last 8 to 10 small ones. The abdominal uncini are much smaller, with relatively shorter bases, the neck narrower and the crest higher, with more numerous rows of spines. The uncini are nearly colorless, the capillary setæ glistening yellow.

North of Sendai Bay, 3,768, 25 fms., type and one other specimen with portions of a thick mud tube.

Amphitrite cirrata Müller.

North Japan, 3,771, 61 fms., numerous specimens of small size.

Pista cristata (Müller) Mgrn.

Sagami Bay, 3,698, 153 fms.; North Japan, 3,771, 61 fms.

The branchiæ exhibit the usual asymmetry. The papillæ above the setigerous processes are on the posterior end of VI and VII, not on VII and VIII, as they are said to be in European specimens.

Scionella gen. nov.

Sides of the first 4 somites bearing prominent wings; a single pair of branchiæ arising from a transverse dorsal fold; setæ begin on IV.

Scionella japonica sp. nov. (Pl. XXVI, figs. 79, 80.)

The type, which consists of 49 somites, a few of the posterior ones having been lost, measures 70 mm. long and 5.5 mm. in greatest diameter. Rather slender, and only very indistinctly divided into thoracic and abdominal regions.

Prostomium a rather thick, prominent, trefoil-shaped fold, which projects stiffly out above and at the sides of the mouth, its margin somewhat rolled outward, a dorsal ridge behind the tentacles. No visible eyes. Tentacles at least 15 on each side, rather large, grooved longitudinally but in these specimens much contracted, broad and flat. Peristomium distinct all around, produced ventrally into a free margin, within which the rather large quadrate lower lip is visible, and which ends laterally in a pair of wing-like lateral lobes; dorsally very short, appearing as a mere ridge behind the tentacular ridge and bearing a dorsal pre-branchial tubercle on each side.

The 2d, 3d and 4th somites have no ventral folds but bear still more prominent wing-like lateral lobes, which rise successively to a higher level and overlap from behind. Those of somite IV are united across the dorsum by a high transverse fold which slopes upward and forward above III and bears the gills on its free edge. The next 10 somites are well marked, triannulate dorsally and with distinct ventral plates which undergo no change in form except that the last has roughly the form of an equilateral triangle. Somewhat large and swollen postbranchial tubercles occur above the parapodia on all somites of this region as far as XIV. The whole region is somewhat depressed, smooth, and convex above, flattened below, with distinct longitudinal grooves above and below the parapodia. The next 10 or 12 somites are large and their boundaries indistinct, while the remaining ones are sharply defined, shorter, and distinctly subdivided into annuli. Throughout the greater part of the abdominal region the dorsum is arched and the

venter flat, with a neural groove, but near the caudal end the body is more depressed.

The single pair of branchiæ, which arise as indicated above from the 4th somite, are large and conspicuous and divided into numerous filaments, which are so crowded that they appear to arise together from a common point, but which really spring in a unilateral pinnate fashion from a spirally wound stem. The latter makes about 3 turns, but owing to the closeness of the filaments, the bases of which are in actual contact, the number is somewhat uncertain. In line with the branchiæ somites II and III both bear dorsal tubercles, which are especially prominent on III, on which, in both specimens, a second smaller tubercle occurs at the base of the larger one; these are probably reduced gills, and, were it not for the exact correspondence of the two specimens, might be supposed to be regenerating.

On somites VI, VII and VIII short but prominent processes are present between the setigerous and uncigerous tori, just behind the setæ line. A small sense-organ may be found in a corresponding position in relation to most of the posterior parapodia.

Setæ begin on IV as a small tuft high up at the foot of the dorsal fold. On all remaining somites the parapodia are ventro-lateral, but as the uncigerous ridges are much longer on the anterior than the posterior thoracic somites, the slender setæ are at first more elevated in position, and gradually sink as the uncigerous tori diminish in extent. The abdominal parapodia have the base contracted and the dorsal angle somewhat produced.

Slender setæ are found on 17 somites, from IV to XX inclusive, are rather few in number, especially on IV, and are always arranged in a short compact vertical row. The shafts are pale yellow, fibrous, rather long, more or less strongly curved in a sigmoid fashion toward the end, with a mucronate tip, below which each side is provided for a short distance with a rather broad, delicately striated wing with entire margin terminated rather abruptly at its distal end. Different setæ differ greatly in their curvature and the extent of the wings, some being nearly straight with almost symmetrical wings, others almost angulated with the greatest width of the wings alternating. Uncini are found in all somites except the first four. In the thoracic region they face alternately backward and forward, and interlock in a double row, are nearly colorless, with short somewhat triangular bases, a short neck, narrow sinus, strongly hooked, stout, acute rostrum and an apical crest of 5 transverse rows of spines, the lowermost consisting of about 4, the others much more numerous, up to 10 or 12. In the abdominal region

the uncini have the number of apical spines greater and all face forward in a single much-crowded row, which on XXV contains 65, while a thoracic torus (XVIII) contains 160.

A decided purplish tint remains anteriorly, otherwise the color is all gone.

North Japan, 3,775, 57 fms., type only; Suruga Bay, 3,378, 167 fms.

Polymnia nesidensis (Del. Ch.) Marenz. var. *japonica* nov.

The Japanese examples differ constantly from the European as described by v. Marenzeller, Saint Joseph and others in the longer stalks and fewer branches of the gills and in the less elevated heads of the uncini in which the rostrum and the contiguous margin of the base are parallel.

Sagami Bay, 3,704, 94 fms.; Suruga Bay, 3,707, 63–75 fms.; Sendai Bay, 3,768, 25 fms., type.

Loimia arborea sp. nov. (Pl. XXVII, figs. 81, 82.)

The type of this species is 120 mm. long and nearly 10 mm. in diameter in the thoracic region; it consists of 74 somites. Form robust, with the anterior or thoracic region of 19 somites contributing nearly $\frac{1}{2}$ of the entire length.

Prostomium very broad, prominent, almost surrounding the mouth, except for the space occupied by the small tubercle-like lower lip, thrown into 3 deep vertical folds, of which the median is much higher than the symmetrical laterals. Tentacles very few in number (many perhaps detached, though the scars are not visible), small, broad and flattened, the larger ones almost foliaceous in the contracted state, marked at regular intervals by 4 or 5 transverse bands. No eyes visible. Prostomium with a prominent free anterior border ventrally and laterally, ending above in a pair of conspicuous rounded lobes, just internal to which, on the dorsal surface, is a pair of smooth rounded eminences similar to those which occur on succeeding somites.

Somites II and III are only obscurely distinct ventrally, but quite so, though short, dorsally; II has a free anterior border, much like the peristomium, and still more prominent dorso-lateral lobes, which are, perhaps, contributed partly by III. Succeeding somites, both of the thoracic and abdominal regions, are well separated, and more or less distinctly annulated. Well defined ventral plates occur on somites V to XI, occupying the entire distance between the uncigerous tori, but becoming rapidly smaller as the tori extend and shift to a more ventral position; the last one is divided by a cross furrow, the others are entire;

on XII and XIII the plates are continued by an indistinct, much wrinkled and subdivided glandular area, while anteriorly both IV and III are glandularly thickened on the ventral surface. On the first 10 or 11 somites a smooth rounded glandular (?) elevation occurs on each side just dorsad and mediad of the notopodial tubercle; on the anterior postbranchial somites these tubercles run together into a low longitudinal ridge. Anus terminal, large.

There are 3 pairs of branchiæ on II, III and IV, the first somewhat the largest, and the third slightly the smallest, all beautifully arborescent, with about 6 main branches from a central stem, and numerous and fine subdivisions with a somewhat spiral arrangement, resulting in a rather acute conical form, which in life must be very beautiful and conspicuous.

The third somite bears a dorsal setigerous tubercle only on its dorso-lateral angles; the next 16 have dorsal setigerous tubercles and ventral uncigerous tori. The latter are at first high up, but gradually assume a more ventral position, until the last 9 are almost entirely on the ventral surface, and the last 7 or 8 are separated by a median interspace not exceeding their own transverse extent, which increases from before caudad.

Slender setæ in a dense tuft, arranged more or less in the form of an arc or horseshoe open ventrally or anteriorly. They are of two kinds: simple colorless capillary setæ, not especially slender, and glistening straw-colored lance-shaped setæ, with strongly fibrillated shaft, and the end broadly margined on one side, narrowly on the other, both flanges reaching nearly to the tapering pointed tip, and marked with oblique fibrillæ, which sometimes wear into a slight fringe, especially on the broader margin.

On somites IV to XIX the uncini are arranged in 2 rows, opposite and facing each other, when retracted, in a groove; on the abdominal segments they form a single short row facing the head on the extreme end of the uncigerous process. Their number is very great in the posterior thoracic segments, the posterior row on XIX containing 260 and the anterior row evidently a considerably greater number. As in other species of the genus the uncini are broad, flat pectinate plates, the thoracic ones very constantly bearing 5 long sharp curved processes, with a rudimentary apical 6th, and a minute tooth between the first spine and the anterior muscular process of the base; the abdominal uncini have the 6th process usually well developed and the muscular processes more pronounced.

Suruga Bay, 3,723, 13-16 fms., type only.

Trichobranchus bibranchiatus sp. nov. (Pl. XXVII, figs. 83-85.)

The largest specimen has a length of 16 mm. for 29 somites, the caudal end being absent; the thoracic diameter is 2 mm.; almost double the abdominal.

Prostomium restricted to the region above the mouth, bilobate, consisting of a pair of rounded tentaculiferous cushions incompletely separated posteriorly. No eyes. Tentacles very numerous, forming a thick tangled mass above the mouth; they are of two forms, slender ones, which are by far the most numerous, arising from the entire margin of the cushions, and much larger ones, the ends of which are often broad and flat, whose origin is confined to the anterior and median region of the cushion border.

Peristomium simple, short above, much enlarged below to form a very high thick lip, the exact limits of which are uncertain owing to the partial protrusion of the buccal chamber. Connected with the peristomium and probably peristomial in origin is a pair of very wide, thin, delicately nerved, wing-like lobes, which arise on each side from beneath the prostomium and extend prominently laterally and anteriorly to a distance considerably exceeding the length of the prostomium. The remaining somites are regular and distinctly marked, without collars or lateral lobes to any of the anterior ones; the setigerous ones of 2 annuli, of which the anterior is usually the largest and bears the tori. The thoracic region, comprising the first 20 somites, is thick and quite terete, the abdominal suddenly contracted to $\frac{1}{2}$ the diameter of the thoracic, and flattened or even longitudinally grooved on the ventral surface. Two pairs of simple unbranched gills arise from the dorsum of somites II and III; they are slender and tapering and their length considerably exceeds the greatest diameter of the body. The thoracic setigerous tori are elevated flattened tubercles, the uncigerous tori very small and low; abdominal uncigerous tori also very small but quite conspicuously elevated.

Slender setæ begin on VI and continue to XX, or for 15 somites. They form a short vertical rank of 14 to 20, usually in pairs of 1 large and 1 small seta. Setæ almost colorless, slightly curved, tapering, pointed, with entire tip and narrowly doubly winged margins. Uncini also begin on VI, and occur on all the following somites. They are always arranged in a single row, with their points directed forward and, on the thoracic somites, toward the dorsum; the series is slightly caudad of the slender setæ on the thoracic somites and begins almost in contact with them. The first torus (on VI) is short, and contains about 14 uncini, the number increasing to 32 on IX, and decreasing after XVI

to 23 on XX, the last thoracic somite. The thoracic uncini spread in a fan-shaped figure; they are colorless or pale brown, long, slender, with curved somewhat striated stem, increasing slightly in diameter to the surface of the body, then suddenly contracting to a narrow neck beyond which even more abruptly expanding into the remarkably bird-like head, with a blunt beak and a crest of 5 or 6 finely divided transverse rows of very numerous teeth, together having a nearly spherical form as viewed from above. The abdominal uncini number about 35 in the anterior somites, and are arranged in a marginal row about the torus, to the center of which the slender ligaments converge. They are nearly colorless, with short, broad, nearly triangular bases, upon which the only slightly expanded head is sessile; rostrum prominent and above it 2 or sometimes 3 transverse rows of numerous spines.

Station not given on label.

There is considerable conflict between the several published accounts of *T. glacialis* Mgrn., but the present species differs decidedly from those described from typical European localities in the entire absence of eyes, the wider cephalic wings, constancy of 2 pairs of gills, the form of the uncini and greater number of slender setæ.

***Terebellides strœmi* Sars.**

The typical variety of this nearly cosmopolitan species occurs in Sendai Bay, 3,767, 14 to 18 fms., and probably in Suruga Bay, 3,724, 20 fms.

Var. *japonica* nov.

All of the specimens of *Terebellides* taken in Sagami Bay differ from the typical variety in having a much smaller number of prostomial tentacles and wider margins to the slender setæ. They have a length up to 70 mm. The proportions of the gill lobes vary considerably; and in one example from 3,704, the posterior lobes are undeveloped.

Sagami Bay, 3,695, 175-190 fms., types; 3,698, 153 fms.; 3,704, 94 fms.; 3,738, 167 fms.

AMPHARETIDÆ.

***Amphiteis japonica* McIntosh.**

Two fine specimens taken at station 3,771 are much larger than those originally described by McIntosh from south of Yedo; they measure 45 mm. in length. The branchiæ are perfect and are round as in *A. gunneri*, not flattened as doubtfully stated by McIntosh; the uncini are also somewhat narrower than is figured for the types, but other specimens conform exactly to the originals in this respect. The tube is tough and parchment-like, and covered with a thick coating of fine silt.

Sagami Bay, 3,698, 153 fms.; Sendai Bay and northward, 3,767, 14-18 fms.; 3,771, 61 fms.

AMPHICTENIDÆ.

Cistenides hyperborea Mern.

Off Kamchatka this species was found in very great numbers on a soft muddy bottom in shallow waters, and a single small example in Sendai Bay. The paleoli vary somewhat in number and length, but are almost invariably 12 or 13 on each side. In the specimens from station 3,777 they are so thickly incrustated with a brownish deposit as to appear club-shaped.

Sendai Bay, 3,767, 14-18 fms., one small example; off Kamchatka, 3,776, 3,777, 3,780, 12-13 fms.

MALDANIDÆ.

Nicomache (?) *inornata* sp. nov. (Pl. XXVII, figs. 86, 87, 88.)

Head and 14 anterior setigerous somites only known, these having a length of 55 mm. and a diameter of 3 mm. Owing to the absence of the anal funnel the generic reference is doubtful, the form of the setæ having chiefly led to the selection of *Nicomache* rather than *Lumbriclymene* or a related genus.

Prostomium and peristomium completely coalesced into a rather slender head, which is twice as long as thick and truncated at a rather acute angle; prostomial lobe or palpode pointed, curved dorsad, continuous with both median ridge and lateral margins of cephalic plate; cephalic plate indistinct, its posterior half somewhat gibbous, the anterior concave, passing with rounded margins into the dorsal and lateral surfaces of the head, no produced marginal folds; median ridge about $\frac{1}{2}$ length of cephalic plate, rather low and broad, passing anteriorly into palpode, posteriorly indistinctly into gibbous portion of head; sensory grooves well marked on each side of ridge and external to these again triangular depressed areas bounded by the lateral margins of cephalic plate. Peristomial region of head slightly compressed; mouth rather large, ventral, bounded posteriorly by a prominent pouting, but rather narrow, lip.

First 4 setigerous somites short, cylindrical, decreasing slightly in length, each with an anterior annular ridge just in front of the seta line; succeeding segments longer and more slender, but never much elongated, boundaries very obscure after VIII; somites VI to IX with anterior glandular rings but no distinct collars; all somites except the first 5 more or less marked with lateral vertical grooves and folds. Head and anterior region of body very smooth. Tori indistinct and laterad on anterior somites, thick swollen and more ventral after IX.

Capillary setæ of 2 kinds, both few in number, in the dorsal bundles; those found on all setigerous somites are relatively large, fibrillated, tapering, the tips acute and sometimes curved, with a short distinct flange on one side. Fringed capillary setæ are found in the middle somites; colorless, very slender, with elongated tips, with rather widely separated, short hairs closely appressed to, and usually arranged in pairs on both sides of the shaft of the seta. Farther back these are replaced by setæ which are doubly winged at the base of the exposed portion, beyond which are extremely long faintly fringed capillary tips.

Crochets yellow, with curved tapering fibrous stems, which are not shouldered and only slightly enlarged at the surface of the body; exposed portion long and slender, the head not much enlarged, but provided with a very long, sharp beak, the tip of which is slightly recurved; accessory teeth 4 to 6, the first large and typically standing sharply apart from the beak, the others also slender and distinct, except the 1 or 2 smallest, which are more obscure and fibrous; guard greatly developed, in 2 lateral halves, each formed of about 23 strong hairs joined together above the teeth by a membrane-like band beyond which the hairs are much finer and may constitute a delicate fibrillated web, arching over the basal half (not the tip) of the principal hook and meeting the opposite half of the guard above; no distinct subrostral process. On somite V the crochets are only bent, not hooked, with one large and one smaller blunt vitreous process, and a group of small fibrous ones; guard, if perfect in the example studied, consisting of a few gently curved subrostral hairs reaching only as far as the point of the principal spine.

Acicula bright yellow, one each on ventral side of tori of II, III and IV, stout, tapering to a blunt point, and fibrous.

Tubes fragile, of coarse, dark-colored sand grains and bits of shell.

Suruga Bay, 3,713, 65 fms.; 3,725, 13 fms., type.

Clymene mirabilonga sp. nov. (Pl. XXVII, figs. 89-93.)

Head uniannulate, the prostomium and peristomium completely united, short, somewhat compressed, vertical diameter equal to greatest length on ventral side; mouth ventral, large, bounded posteriorly and laterally by a rugous crescentic fold, anteriorly by the wrinkled base of the rather narrowly triangular, pointed, prostomial lobe or palpo; cephalic plate very broad, nearly orbicular when the limbate margin is spread, broadly oval when viewed from above with margin in normal position, the margin divided by a pair of clefts into anterior and posterior lobes, of which the latter is $\frac{2}{3}$ as long as the former; posterior lobe suberect, faintly divided by median and lateral emargina-

tions into 4 slightly marked sub-lobes; anterior lobes also suberect, much higher than posterior, with smooth, rounded, entire margins anteriorly meeting the palpode, from which they are separated by a distinct sulcus; median ridge nearly $\frac{3}{4}$ length of cephalic plate, very narrow, high and prominent, with a sharp compressed summit, of equal width throughout, ending anteriorly in a short palpode about 3 times its width but still narrow; sense organs bounding median ridge rather broad, shallow depressions, included with the ridge in a narrow lyre-shaped area occupying the middle $\frac{1}{3}$ of the cephalic plate exclusive of the limbate margin, with its base dorso-caudad, while the arms fade out anteriorly to the sides of the palpode.

Head and anterior somites divided into numerous small raised areas which under a lens have an appearance and lustre like the human skin. First 4 setigerous somites short, diameter and length about equal, and length slightly decreasing to the 4th, first very broadly attached to the peristomium; from the 5th setigerous somite (VI) the length increases to X, though IX, which is separated from X only by a very obscure furrow, is somewhat shorter than VIII; no specially developed collar, though each anterior somite is extended into a low fold which somewhat embraces its predecessor, and which is strongly glandular on VII, VIII and IX; last 3 setigerous somites (intervening ones unknown) decreasing in length, cylindrical, the last in this specimen much shorter than thick, but probably it and the following achæitous somites are considerably contracted; 2 preanal and anal somites very short, slightly telescoped, with posterior margin prominent, and on the anal somite forming a sharp annular shoulder from the center of which the anal funnel arises. Anal funnel with a short stalk, having a diameter of about $\frac{1}{2}$ the body of the anal somite, but spreading in a low corolla form to the diameter of the latter, in length equalling the anal and one preanal somite; its margin regularly denticulate with 43 regular, pointed, triangular teeth longer and narrower than those of *Axiotea campanulata*, with an occasional one bifid, and none in the neural line, which is very distinct to the edge of the funnel; anus central, surrounded by minute papillæ and radiating ridges, but not elevated on a large central papilla. The relation of the funnel to the anal somite in the type specimen is probably due largely to contraction.

First eight setigerous tori on anterior end of somites, the others posterior; anterior tori very low and obscure, becoming swollen and conspicuous by X; on last 3 setigerous somites prominent and reaching well ventrad, where they are separated by a median distance of about $\frac{1}{3}$ their length, the interspace being occupied by a glandular area;

tori and glandular areas remain on the 2 preanal somites, and also slightly indicated on the anal but bear no setæ.

Peristomium and last 3 somites without setæ. First 3 setigerous somites with a dorsal tuft of slender setæ and a single ventral aciculum, but no crochets; other setigerous somites with a small dorsal fascicle of slender setæ and a ventral series of crochets, the number of which increases for several somites caudad.

The resemblance between the setæ of this species and *Nicomache capensis* is noteworthy. Slender setæ of 3 forms, the first, which occurs on all setigerous somites, is pale greenish-yellow, with a core of parallel fibres, long, tapering, with a distinct wing on one margin and a much narrower one on the other, both leaving a long very fine tip free. The second form is confined to an undetermined number of anterior somites as far as X; colorless, exceedingly slender and very delicately doubly fringed. The third form is found only posteriorly, the anterior limit being undetermined; colorless, with a long, slender shaft of nearly uniform diameter, the terminal part of which bears rather broad chaff-like bearded processes, the exact arrangement of which cannot be determined but appears to be singly spiral toward the tip, paired toward the base, the whole closely resembling the fruiting head of certain grasses.

Anterior acicula simple, stout, pointed, slightly curved fibrous spines of a yellow color.

Crochets yellow, with slender, tapering, curved, very fibrous stems, strongly shouldered at surface of body, then constricted to a narrow brittle neck, and again expanded terminally into a coarse broad head; terminal part unusually prominent and consequently frequently broken off; principal hook prominent, acute, rather slender and, except at the base, non-fibrillated; supported and surmounted by 4-6 spines, of which the first is large and vitreous, the others much smaller and, like the expanded portion of the head, strongly fibrillated; beard greatly developed, consisting of a transverse row of a small number of tapering sickle-shaped hairs which arise from a stout transverse basal plate, supported on a slight subrostral shoulder, and curve high over the apex of the principal hook to end in fine curled tips above its base. The anterior crochets differ only in the position of the beard, which arises much closer to the rostrum than in the more posterior ones, and in their somewhat smaller size.

The head and tail ends of the type specimens were found several miles apart.

Suruga Bay, 3,714, 60 fms., head; 3,725, 13 fms., caudal end.

Maldane sarsi Mgrn.

This species has already been recorded by McIntosh from south of Yedo and by Wirin from the Vega collections in Bering Sea. The "Albatross" examples are of small size and are referred somewhat doubtfully to this species as they differ from the published figures and descriptions in several respects. The palpode is much broader with very numerous eyes, the cephalic plate inclined to the longitudinal axis at a very acute angle, the median ridge posteriorly depressed and obscure, the anal plate broader and each dorsal angle of the ventral lobe produced into a distinct spine. There are also some peculiarities of the setæ. The anterior end, and especially the head, is generally closely spotted with reddish-brown.

Sagami Bay, 3,695, 175-190 fms.; 3,798, 153 fms.

Maldane coronata sp. nov. (Pl. XXVII, figs. 94, 95, 96.)

This is a large species, the type of which measures 130 mm. long by 5 mm. in greatest diameter in a contracted state, while fragments of other specimens from the same locality are more than twice as large, so that a length of 300 or 400 mm. in life is not improbable.

Head acute, cephalic plate narrowly ovate, produced anteriorly into a pointed thin process or palpode, limbate margin prominent, divided on each side by a lateral cleft which passes into a deep slit on the side of the peristomium; the posterior half high, erect, its margin coarsely serrate with 15-22 teeth, which are large anteriorly, and progressively diminish in size toward the dorsal mid-line; anterior half lower, more spreading, passing into the anterior palpode without sharp demarkation, its margin bearing on each side from 4 to 7 (commonly 5) stiff processes, decreasing in size from behind forward, and the largest about $\frac{1}{2}$ the width of head, often asymmetrical and sometimes bifurcated; median ridge moderate, about $\frac{1}{2}$ cephalic plate, its posterior end about opposite the most anterior marginal process, anteriorly ending in much broader palpode, rather low and wide but prominent and sharply defined by deep, narrow, sensory grooves. Peristomium short, biannulated by the deep lateral grooves above alluded to, which cut off a small incomplete anterior ring.

All following preanal somites (19 in number) are setigerous; II to V short and biannulate, the anterior annulus the larger; VI and VII transitional, the others uniannulate and elongated, the last few diminishing somewhat in length, the furrows indistinct.

Anus dorsal, external to funnel, between this and a prominent integumental fold which covers it. Anal funnel very large, divided by a pair of oblique lateral clefts into dorsal and ventral lobes; ventral

lobe the smaller but constituting most of the funnel proper, its margin variable in exact shape, but always somewhat uneven and irregular, crenulated or slightly toothed; dorsal lobe much more prominent and consisting chiefly of a large, flaring platform-like structure each side of which has 3 blunt angular marginal prominences, bearing as many slender filamentous processes nearly as long as the anal funnel. One very large specimen, of which only the posterior end is preserved, differs in having the ventral lobe very finely denticulated, the dorsal less flaring, with an even margin and bearing 11 filaments much shorter than usual. It may prove to be representative of a distinct species as other specimens of nearly equal size are quite typical in these respects.

On the first 4 setigerous segments the setæ are borne on thin wing-like vertically elongated ridges, on the remainder on thick swollen tori, which are especially prominent on VII, VIII and IX and on XVII, XVIII and XIX; on V, VI and VII the tori are united by transverse ventral thickenings, but elsewhere are quite distinct and entirely lateral. The tori are anterior on the first 9, posterior on the remaining setigerous somites.

Somite II bears only capillary setæ, III, IV and V a small ventral series of about 6 or 7 crochets, in addition to the slender setæ, the other somites long ventral series of crochets, varying from 37 to 41 in each group on specimens of average size, and a small dorsal tuft of slender setæ.

Capillary setæ have a hyaline cortex and a slightly yellowish fibrous core, the more superficial fibres of which are very accurately parallel, tip very acute but tapers mostly in the middle $\frac{1}{3}$ of its exposed part; wingless on the first setigerous somite, but farther back the cortex is produced into a narrow flange on the dorsal side.

Crochets stout, stems long, curved, tapering, with a distinct shoulder at the surface of the body and beyond it a narrow region which gradually broadens into the beaked head. Those of the posterior regions have a strong transparent hook, the base of which is concealed in a hood-like covering of fibrillated spines which rise into a crest of four principal teeth; guard poorly developed, of only 8 or 10 curved hairs united for a considerable part of their length by an intervening delicate web; subrostral process small. Anterior crochets on II to V much less strongly hooked; those in the middle of the series with a large terminal process bent nearly at right angles to the shaft, about 4 smaller fibrous processes, and a beard; the dorsalmost similar but only slightly bent.

Color uniform pale grayish-brown; tori pinkish-orange.

An abundant species represented by numerous examples from the following stations: Sagami Bay, 3,695, 175–190 fms.; 3,698, 153 fms.; 3,704, 94 fms.; North Japan, 3,771, 62 fms.; 3,775, 57 fms., type.

Praxilla challengeræ McIntosh?

A small fragment from the middle of the body bears setæ and crochets exactly like those of this species, but the reference is quite uncertain. The originals were dredged off the coast of Portugal.

Suruga Bay, 3,707, 63–75 fms.

Axiotea campanulata sp. nov. (Pl. XXVII, figs. 97, 98, 99.)

A single complete example represents this fine species. The length is 185 mm., the greatest diameter 6 mm., the number of somites 23, of which nineteen are setigerous.

Prostomium and peristomium completely coalesced to form the head, which is truncate at an angle of about 45°, and is twice as long below as above. Cephalic plate broad oval in outline; the free margin nearly equally developed all around except where interrupted anteriorly by the free end of the median ridge, but more erect posteriorly, its margin smooth and entire, except for a shallow notch and reëntering angle on each side about $\frac{1}{3}$ of the distance from the anterior end and opposite the posterior end of median ridge, anterior to which the margin rises slightly to form the anterior free lobes; median ridge pronounced, but short, reaching from the anterior end for $\frac{2}{3}$ length of plate and ending in front in a small rounded, not expanded, lobe, which occupies the opening in the limbate margin at that point, bounded laterally by deep, narrow longitudinal chinks (nuchal sense-organs), from which a broader transverse groove passes to the lateral margin on each side, meeting it just in front of the notch. Mouth directed ventrad, surrounded by a regularly ribbed ring or wreath which is incomplete only anteriorly, the interval being occupied by the wrinkled base of the nearly triangular prostomial lobe (palpode), the rounded apex of which curves upward to join the anterior end of the median cephalic ridge.

First 7 setigerous somites cylindrical, short, diameter and length about equal, no especially developed collar on any, but the anterior margin of each somewhat prolonged as a fold enveloping the preceding somite, especially on the ventral side; anterior fold of somites V to VIII glandularly thickened. The next apparent somite is elongated and bears setæ at both anterior and posterior ends, whereas the preceding somites bear them anteriorly and the succeeding posteriorly only, and therefore, although there is no indication of a furrow, is con-

sidered to represent somites IX and X, forming a transition region between the 2 ends of the worm. Succeeding segments become narrower to the anal, but increase in length to XV, beyond which they gradually decrease; their form is somewhat club-shaped, being narrow anteriorly, increasing to the region of the glandular tori near the posterior end, and again abruptly diminishing; in contraction the posterior end of each probably invaginable, forming low collars in reverse of those at anterior end. Somites VIII to XVIII marked laterally by a series of vertical furrows and folds, which become longer caudad; dorsum and venter smooth; anal and preanal somites marked by circular grooves and ridges extending all around. Neural line distinct for entire length, ending on margin of anal funnel between two teeth.

Anal funnel very large, nearly equalling widest part of body, regularly bell-glass-shaped, somewhat longer than wide, margin completely and very regularly encircled by 31 short, triangular teeth of equal length, two of them being double, and the mid-ventral line being an interval between two teeth. Anus prominent, on a radially ridged papilla in the centre of the funnel, the cavity of which is rather shallow.

Setæ are present on 19 somites, the peristomium, anal and 2 preanal somites being achætous, though the latter retain the glandular tori. Setigerous tori are all situated on the sides of the ventral half of the body; those for capillary setæ short, rather prominent non-glandular, double folds, from the cleft between which the setæ appear; uncigerous tori narrow, raised ridges on first 3 setigerous somites, elsewhere glandular elevations cleft at the apex, becoming long, thick and prominent posteriorly, and those of each pair on VI to X and XX and XXI united by glandular rings.

Capillary setæ only are found on II, and both capillary setæ and uncini on all other setigerous somites. The largest number of the former occurs on II, decreases to IV, while V to XIX bear only a small but prominent dorsal fasciculus. Uncini are numerous from their first appearance, and increase in number from about 20 on III to 48 on somites of the posterior half, the tori having meanwhile increased to 3 times the length of those on III and extended so far ventrad as to be separated by a median distance of less than $\frac{1}{2}$ their length.

Capillary setæ pale greenish-yellow, the slender exposed portions colorless with a vitreous cortex and a fibrous centre of remarkably regular arrangement, very fine, straight, tapering, acutely pointed, and delicately winged on the dorsal side on all somites.

Uncini yellow, somewhat smaller on the anterior and ventral portions of the posterior tori, those in the latter position differing some-

what in shape. Typical uncini with rather slender curved internally fibrous stems, without a distinct shoulder but rather gradually thickened on one side, external to the body contracted in diameter and bent dorsad, then broadly expanded into the terminal head, which is provided with one very large scarcely fibrous hook supported by usually 4 successively smaller fibrous ones, which do not form a cap-like structure; guard or beard moderately developed, consisting of about 20 stiff slightly curved hairs, somewhat divergent from a prominent subrostral process and enclosing the tip of the principal hooked process.

The type only known from Suruga Bay, 3,739, 55-65 fms.

CHLORHÆMIDÆ.

Stylaroides borealis (Hansen).

A single specimen which conforms closely to the description of this North Atlantic species, but is fully three times the length of the original specimens taken off the coast of Norway, was dredged at station 3,775, North Japan, in 57 fms.

STERNASPIDÆ.

Sternaspis scutata (Ranzani) Otto.

The only difference which can be detected between these and European specimens is that the gill plates of the former are slightly more prolonged anteriorly.

Suruga Bay and vicinity, 3,709, 173-260 fms.; 3,739, 55-65 fms.

EXPLANATION OF PLATES XXIII, XXIV, XXV, XXVI, XXVII.

Unless indicated otherwise all setæ figured are from somite X or that immediate neighborhood.

- PLATE XXIII, Fig. 1.—*Eumidea cæca*, terminal portion of a neuropodial seta. $\times 480$. 1a, the articulation of the same, $\times 820$.
 Fig. 2.—*Polynoa semierma*, middle neuropodial. $\times 332$.
 Fig. 3.—The same, dorsal neuropodial. $\times 332$.
 Fig. 4.—*Scalesetosus formosus*, dorsal neuropodial. $\times 480$.
 Fig. 5.—*Scalesetosus formosus*, ventral neuropodial, outline only. $\times 480$.
 Fig. 6.—*Scalesetosus formosus*, notopodial. $\times 480$.
 Fig. 7.—*Lepidonotus branchiferus*, middle neuropodial. $\times 130$.
 Fig. 8.—*Lepidonotus branchiferus*, guard of a neuropodial seta in process of being shed. $\times 130$.
 Fig. 9.—*Lepidonotus branchiferus*, portion from the middle of a notopodial. $\times 586$.
 Fig. 10.—*Lepidonotus chitoniformis*, middle neuropodial. $\times 130$.
 Fig. 11.—*Lepidonotus chitoniformis*, portion of a notopodial. $\times 586$.
 Fig. 12.—*Lepidonotus celoris*, middle neuropodial. $\times 332$.
 Fig. 13.—*Lepidonotus vexillarius*, dorsal notopodial. $\times 480$.
 Fig. 14.—*Lepidonotus vexillarius*, portion of middle notopodial. $\times 480$.
 Fig. 15.—*Lepidonotus vexillarius*, ventral neuropodial. $\times 332$.
 Fig. 16.—*Hylosynda carinata*, middle neuropodial. $\times 332$.
 Fig. 17.—*Hylosynda carinata*, notopodial. $\times 332$.
 Fig. 18.—*Hylosynda magnacornuta*, middle neuropodial. $\times 110$.

- PLATE XXIV, Fig. 19.—*Lætmatonice pellucida*, notopodial. $\times 74$.
 Fig. 20.—*Lætmatonice pellucida*, neuropodial. $\times 74$.
 Fig. 21.—*Restio ænus*, stout neuropodial. $\times 332$.
 Fig. 22.—*Restio ænus*, slender neuropodial. $\times 332$.
 Fig. 23.—*Restio ænus*, slender seta from anterior rank. $\times 332$.
 Fig. 24.—*Restio ænus*, capillary seta. $\times 332$.
 All of the setæ figured in figs. 21–24 are from somite XV.
 Fig. 25.—*Nereis pusilla*, middle notopodial. $\times 480$.
 Fig. 26.—*Nereis pusilla*, ventral neuropodial. $\times 480$.
 Fig. 27.—*Nereis pusilla*, stout neuropodial from a posterior foot. $\times 480$.
 Fig. 28.—*Nereis paucidentata*, typical notopodial. $\times 480$.
 Fig. 29.—*Nereis paucidentata*, ventral neuropodial. $\times 480$.
 Fig. 30.—*Nereis paucidentata*, stout posterior neuropodial. $\times 480$.
 Fig. 31.—*Aricia fimbriata*, one of the stouter anterior neuropodials. $\times 332$.
 Fig. 32.—*Aricia fimbriata*, a slender anterior neuropodial. $\times 332$. 32a. A portion of the same. $\times 586$.
 Fig. 33.—*Aricia fimbriata*, portion of a canaliculated posterior neuropodial represented as seen in optical section. $\times 820$.
 Fig. 34.—*Aricia fimbriata*, portion of a capillary posterior notopodial. $\times 820$.
 Fig. 35.—*Aricia fimbriata*, an incomplete bifurcated notopodial. $\times 586$.

- PLATE XXV, Fig. 36.—*Eunice northioidea*, compound seta from the middle of bundle. $\times 480$.
 Fig. 37.—*Eunice northioidea*, pectinate seta. $\times 480$.
 Fig. 38.—*Eunice northioidea*, uncinus from posterior foot. $\times 332$.
 Fig. 39.—*Eunice quinquifida*, compound seta from middle of bundle. $\times 480$.
 Fig. 40.—*Eunice quinquifida*, pectinate seta. $\times 480$.
 Fig. 41.—*Eunice quinquifida*, uncinus from LX. $\times 332$.
 Fig. 42.—*Eunice mucronata*, compound seta from X. $\times 480$.

- Fig. 43.—*Eunice mucronata*, compound seta from LVI. × 480.
 Fig. 44.—*Eunice mucronata*, pectinate seta. × 480.
 Fig. 45.—*Eunice mucronata*, uncinus from XLI. × 332.
 Fig. 46.—*Eunice gracilis*, compound seta. × 480.
 Fig. 47.—*Eunice gracilis*, pectinate seta from XLI. × 480.
 Fig. 48.—*Eunice gracilis*, uncinus from posterior foot. × 332.
 Fig. 49.—*Eunice medicina*, compound seta. × 480.
 Fig. 50.—*Eunice medicina*, pectinate seta. × 480.
 Fig. 51.—*Eunice medicina*, uncinus from LV. × 332.
 Fig. 52.—*Paranorthia brevicornuta*, compound seta from 3d foot. × 820.
 Fig. 53.—*Paranorthia brevicornuta*, compound seta from 4th foot. × 480.
 Fig. 54.—*Paranorthia brevicornuta*, simple marginal seta from 10th foot. × 332.
 Fig. 55.—*Paranorthia brevicornuta*, pectinate seta from 13th foot. × 480.
 Fig. 56.—*Paranorthia brevicornuta*, uncinus from 11th foot. × 480.
 Fig. 57.—*Northia geophiliiformis*, part of appendix of compound seta, from IV. × 480.
 Fig. 58.—*Northia geophiliiformis*, pectinate seta from XXXV. × 480.
 Fig. 59.—*Northia geophiliiformis*, uncinus from XL. × 480.
 Fig. 60.—*Onuphis cirrobranchiata*, margined seta from dorsal ramus of XII. × 332.
 Fig. 61.—*Onuphis cirrobranchiata*, uncinus from V. × 332.
 Fig. 62.—*Onuphis cirrobranchiata*, uncinus from XXVII. × 332.
 Fig. 63.—*Onuphis cirrobranchiata*, funnel-shaped seta from XII. × 480.

PLATE XXVI, Fig. 64.—*Laranda robusta*, seta from dorsal group of XX. × 130.

- Fig. 65.—*Laranda robusta*, aciculum and seta from ventral group of a posterior somite. × 130.
 Fig. 66.—*Notocirrus zonata*, seta from dorsal group of a middle somite. × 332.
 Fig. 67.—*Notocirrus zonata*, one from ventral group of same. × 332.
 Fig. 68.—*Ninoe palmata*, marginal seta from ventral bundle of XII. × 332.
 Fig. 69.—*Ninoe palmata*, similar one from dorsal bundle of XC. × 480.
 Fig. 70.—*Ninoe palmata*, margined and hooded uncinus from ventral bundle of XII. × 480.
 Fig. 71.—*Ninoe palmata*, uncinus from XC. × 480.
 Fig. 72.—*Cirratus gibbosus*, a notopodial group of one blunt spine and one delicate fringed seta from LX. × 130. *a*, portion of the latter. × 586.
 Fig. 73.—*Chatozone spinosa*, from XXV. × 130. *a* and *b*, enlarged portions of the two setæ at the points indicated. × 586.
 Fig. 74.—*Chatozone spinosa*, spine from XCVI. × 130.
 Fig. 75.—*Goniada foliacea*, a compound neuropodial of average length. × 586.
 Fig. 76.—*Goniada foliacea*, a notopodial from L. × 586.
 Fig. 77.—*Goniada distorta*, a compound neuropodial seta. × 332.
 Fig. 78.—*Amphitrite bifurcata*, an uncinus. × 332.
 Fig. 79.—*Scionella japonica*, an average margined seta from the middle of the bundle. × 332.
 Fig. 80.—*Scionella japonica*, an uncinus. × 332.

PLATE XXVII, Fig. 81.—*Loimea arborea*, a margined seta from XV. × 110. *a*, portion of the same. × 586.

- Fig. 82.—*Loimia arborea*, uncinus from XV. × 332.
 Fig. 83.—*Trichobranchus bibranchiatus*, slender seta. × 332.
 Fig. 84.—*Trichobranchus bibranchiatus*, uncinus. × 820.
 Fig. 85.—*Trichobranchus bibranchiatus*, uncinus from XXII. × 820.
 Fig. 86.—*Nicomache(?) inornata*, portion of capillary seta from XV. × 480.
 Fig. 87.—*Nicomache(?) inornata*, end of crochet from XV. × 332.
 Fig. 88.—*Nicomache(?) inornata*, end of crochet from V. × 332.
 Fig. 89.—*Clymene mirabilonga*, simple capillary. × 74.
 Fig. 90.—*Clymene mirabilonga*, pinnately fringed capillary. × 480.

- Fig. 91.—*Clymene mirabilonga*, spirally fringed capillary. $\times 110$.
Fig. 92.—*Clymene mirabilonga*, entire crochet from a posterior thoracic segment. $\times 32$.
Fig. 93.—*Clymene mirabilonga*, terminal portion of the same. $\times 332$.
Fig. 94.—*Maldane coronata*, capillary seta from III. $\times 110$.
Fig. 95.—*Maldane coronata*, end of dorsal crochet from III. $\times 332$.
Fig. 96.—*Maldane coronata*, entire crochet from X. $\times 332$.
Fig. 97.—*Axiothea campanulata*, capillary seta from II. $\times 110$.
Fig. 98.—*Axiothea campanulata*, entire crochet. $\times 74$.
Fig. 99.—*Axiothea campanulata*, exposed portion of the same. $\times 332$.



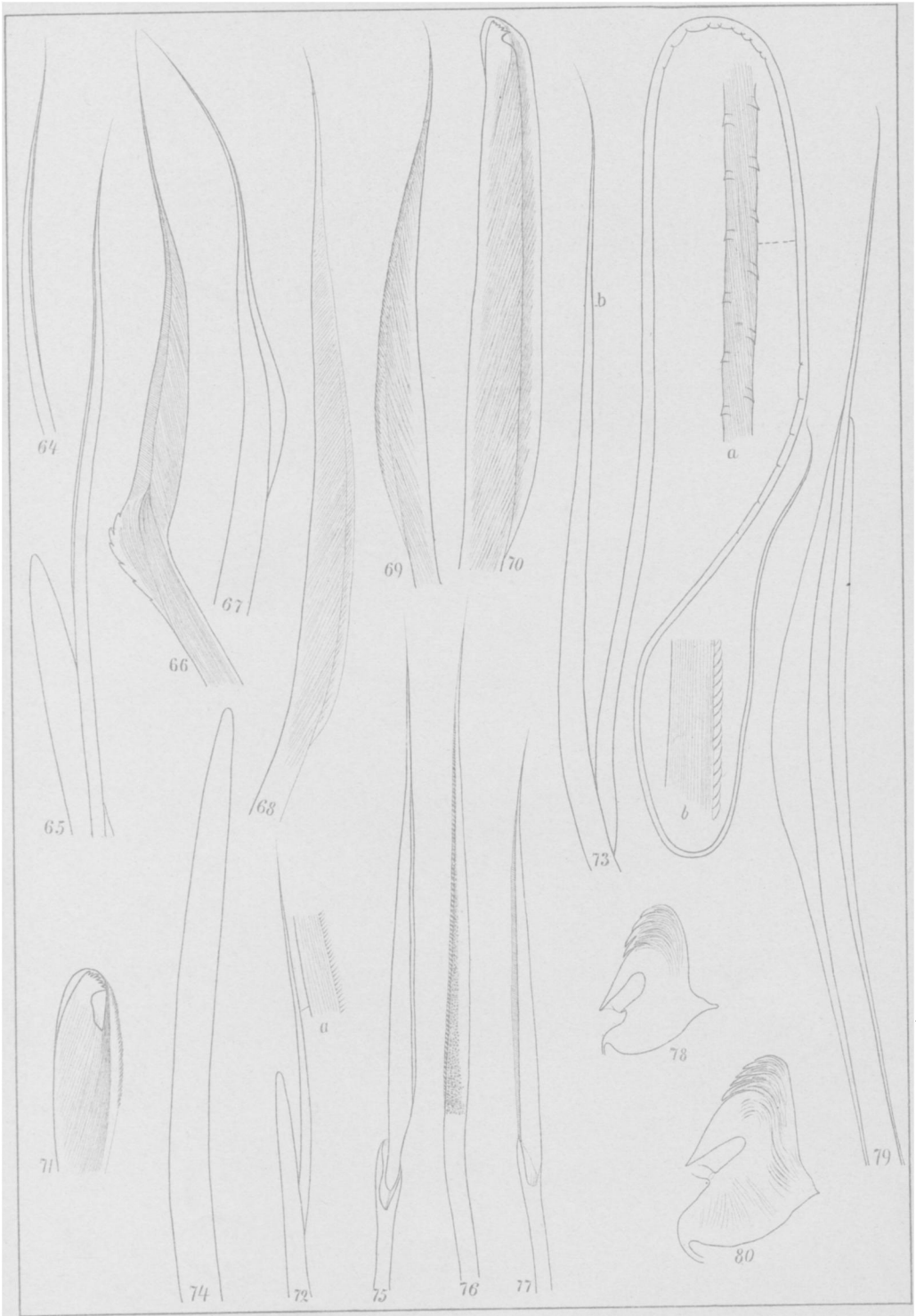
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